DOCUMENT RESUME

ED 176 119 CE 022 787

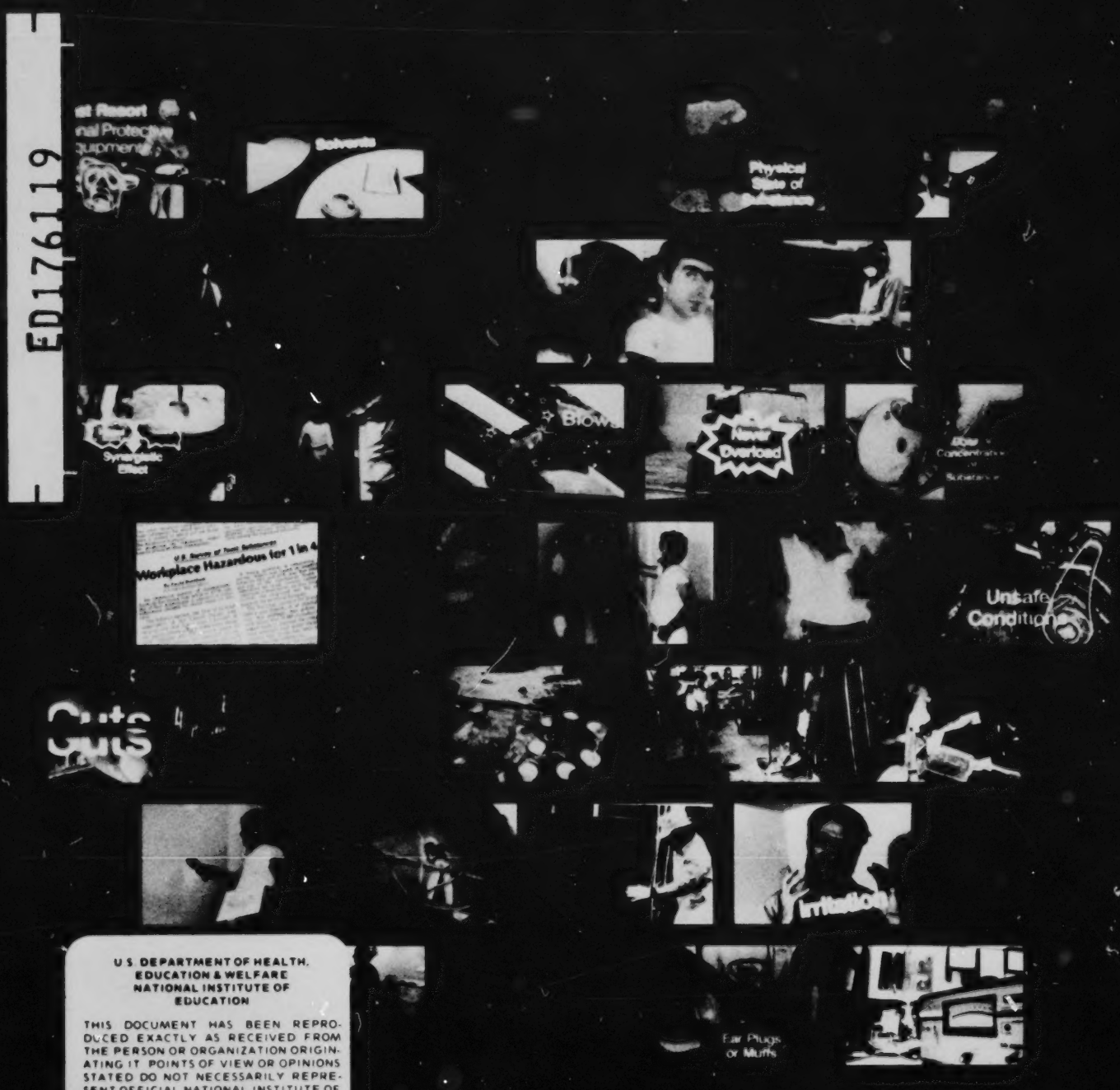
TITLE	IBPAT/OSHA Health and Safety Education Book.
INSTITUTION	International Brotherhood of Painters and Allied Trades, Washington, D.C.
SPONS AGENCY	Occupational Safety and Health Administration, Washington, D.C.
PUB DATE	[79]
NOTE	222p.; Photographs, as well as tables 10 and 16, which contain small print, will not reproduce well; For a related document see CE 022 788
AVAILABLE FROM	IBPAT/OSH Training Project, 1750 New York Avenue, N.W., 5th Floor, Washington, D.C. 20036
EDRS PRICE	MF01/PC09 Plus Postage.
DESCRIPTORS	*Accident Prevention; Accidents; *Building Trades; Health; Health Education; Injuries; Occupational Diseases; *Painting; Prevention; *Safety Education; Safety Equipment; Trade and Industrial Education
IDENTIFIERS	Occupational Safety and Health Act

ABSTRACT

Designed for paint and allied trade workers, this manual/reference guide contains information and guidelines for (1) workers in general occupational health hazards, (2) hazards particular to each trade group, (3) control of occupational hazards, (4) worker rights and responsibilities, (5) how to call in outside help, and (6) Occupational Safety and Health Act standards and policies. Following an introductory section, the first of fourteen additional sections presents facts about occupational accidents in the paint and allied trades. Sections 3 and 4 discuss health hazards and ways of exposure to them. The fifth and sixth sections expound on controlling health hazards and personal protective equipment. Sections 7 and 8 focus on hazards specific to the paint and allied trades and accident causation. Specific accidents such as falls, fires, and strains are discussed in the next four sections. Section 13 describes worker rights and responsibilities relating to health and safety. The final two sections summarize the Occupational Safety and Health Act and the role of safety and health committees. Appended material includes a discussion of widely used substances of the paint and allied trades, guidelines for selecting personal protective equipment, and worker rights and responsibilities. (LRA)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

Health and Safety Education Book



ED176119

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Produced by the IBPAT-OSHA Occupational Safety and Health Training Project

Contract No. J-9-F-7-0042

Funded by

U.S. Department of Labor

Occupational Safety and Health Administration

Ray Marshall
Secretary of Labor

Eula Bingham, Ph.D.
Assistant Secretary of Labor

Joseph Perzella
Contracting Officer's Technical Representative

Sponsored by

International Brotherhood of Painters and Allied Trades, AFL-CIO, CLC

S. Frank Raftery
General President

Robert J. Petersdorf
General Secretary-Treasurer

General Vice Presidents

BERNARD SNIEGOWSKI
1st District

A. L. MONROE
2nd District

JAMES WOLFORD
3rd District

JACK T. COX
4th District

GUY LEBER
5th District

JAMES B. COX
6th District

WILLIAM A. DUVALL
7th District

L. M. RAFTERY
General President Emeritus

Project Director ..... **Donald N. Cagle**

Assistant Project Director ..... **Rodney D. Wolford**

Writer-Producer ..... **Marilyn E. Larson**

Photographer ..... **Les Crandell**

Research Assistant ..... **Russell Bargmann**

Administrative Assistant ..... **Susan R. Breitstein**

with special contributions from:

Harry Heimann, M.D.
Mount Sinai School of Medicine
New York, New York

Edwin C. Holstein, M.D.
Mount Sinai School of Medicine
New York, New York

Frank Kavanaugh
Vice President
Airlie House, Virginia

K. G. O'Bryan, Ph.D.
Director of the Office of Project Research
Ontario Educational Communications Authority
Toronto, Ontario, Canada

Special Thanks to these IBPAT Brothers and Sisters:

John Alfarone
Sal Alfarone
D. W. Annan
Peter Armstrong
Kontantinos Bahas
Herb Barquist
Herb Beard
Bob Becker
Charles Beeman
Deborah Behrendt
Joseph Bongiovanni
James F. Bush, Jr.
Norman Campbell
Frank Carbone
Leedy J. Cave
Robert Cianelli
Vincent Ciffa
Dave Coffta
John Comer
Caroline Cunningham
Patricia Curtis
Betty G. Czad
Harold Dersam
Evelyn Ditsch
Daryl Dobson
William Earhart
John Edwards
Edward Farrell
George Feliciano
Chris Ferris
Jerry Ford
Billy France
James Frazier
Thomas Furia
John Gali
Roger Genson
Frank Giordano
R. Gomez
Charles Graham
Hubert O. Grater
Gary G. Green
James Griffo
Farrett M. Hamilton
Bennie J. Hardima
William Hendrix
Lou Hibit
John Hoey
Robert Holmes, Jr.
Lawrence Hutton
Terry L. James
Pat Johnson
Calvin King
Mark Lazarus
Dennis Lewis
Jewelt K. Logan
Percy Lord
George Lubrich
Harry Maguire
Lee A. Majors
John Manhire
Ray McGoven
Mike McKinzie
J. R. McLaughlin
Victor Mevio
Dick Meyers
Richard Mobley
Clarence Monroe
W. Ray Moore
Jerry Muney
Spiro Nicholas
Robert Olson
David Petersdorf
Victor P. Puhr
Frank Pusateri
John Ragle
Larry Rizzo
Jim Roberts
Jim Rodgers
Pat Schaefer
Robert Schultz
Gene Sciortino
Jose Scott
Roy Shoaf
Buck Shoemaker
Charles Smith
Charles E. Steed
John Strong
William C. Temples
Bill Todd
Lewis L. Tolly
Richard Tompkins
H. W. Valogura
Robert Williams
Michael Wolford

. . . And to:

Earl Baumhart
Les Cadeau
Ronnie Edwards
Billy Garrett
Pete Gobbo
Tim High
Mike Hornberger
Bill Keller
Paul Knobloch
Jack Ludlow
Jack Mobley
Walter Penn
Robert Roland
Robert Schmidt
Terry Selman
Dave Singleton
Lou Sline
Marv Strand
Bob Thompson
Jack Tucker
Jim Tyson
Joseph H. Wagner
Don Wilson
Sam Yankee

Preface

This manual is your guidebook to a safer and healthier workplace.

IBPAT presents here the basic information you need to understand the safety problems of your trade. It presents newly discovered hazards to your health. And it presents methods you can use to protect yourself from these problems.

This OSHA-funded book begins by explaining the national impact of occupational injuries and illnesses. These are not your problems alone, although you are among those on the front lines in this national crisis. Occupational injuries and illnesses affect all Americans in many different ways. National concern and effort are required if these problems are to be solved.

Thousands of chemical and mineral substances are responsible for diseases and disorders among you and your co-workers. This book gives a straightforward explanation of occupational hazards to your health and the illnesses these are known to cause. When to ask for medical help and how to tell your doctor about your work are explained in detail.

Occupational illnesses can be prevented by controlling your exposure to hazards. This book describes how in the next two chapters.

The chapter entitled "Hazards of the Paint and Allied Trades" explains the findings of Dr. Irving J. Selikoff's investigation of your trades, conducted by the Mount Sinai School of Medicine.

The next four chapters tell you how to prevent accidents by the things you do every day in your work. These chapters describe what to look for on your jobsite and actions you can take to avoid injury on the job.

The Occupational Safety and Health Act, the National Labor Relations Act, many state laws and other legislation all guarantee your rights to take certain actions for your own protection on the job. But these rights are worthless unless you know what they are and how to exercise them. The final two chapters tell you exactly what your legal rights and responsibilities are and who you can turn to for answers to the questions you are bound to have.

There will be many times when you want to know something about a substance you are working with. You may wonder where it is used, the way it can enter your body, its harmful effects, its permissible exposure limits, special tests for your doctor to determine whether it is harming you, and the personal protective methods to use if you work with it. The first appendix tells you all of these things about many common substances of the paint and allied trades.

The other appendices tell you such things as the upper and lower explosive limits for solvents, how to select a respirator and how government agencies which handle occupational safety and health problems work.

Occupational health and safety is a complicated national problem. It involves workers, doctors, scientists, government officials, citizen groups, management and labor unions. But on a personal level, it involves you. IBPAT strongly believes in your right to full knowledge about these problems and, most of all, in your ability to contribute to the solutions.

This manual is one demonstration of IBPAT's concern. In the battle for a safe and healthful workplace, IBPAT itself is one of the strongest tools you have for your protection.

TABLE OF CONTENTS

	Page
The IBPAT-OSHA Health and Safety Education Book	1
The Facts	4
Health Hazards	13
Exposure to Occupational Health Hazards	24
Controlling Health Hazards	36
Your Lifesaver: Personal Protective Equipment	46
Hazards of the Paint and Allied Trades	72
Accident Causation: What Causes Accidents	89
Falls—The Number One Accident	116
Fires and Explosions	122
Compressed Air	126
Strains	129
Your Rights and Responsibilities	132
About OSHA	145
Safety and Health Committees	152

APPENDICES

Appendix I:	Widely used substances of the paint and allied trades	156
Appendix II:	Selection of personal protective equipment	188
Appendix III:	Rights and responsibilities	198

The IBPAT-OSHA Health and Safety Education Book

The IBPAT Health and Safety Education Book is written and produced by the International Brotherhood of Painters and Allied Trades and funded by the Occupational Safety and Health Administration as part of an ongoing cooperative effort among labor, management and government devoted to the creation of safe and healthful working conditions.

The International Brotherhood of Painters and Allied Trades, IBPAT, is a 90-year old labor organization with approximately 200,000 members engaged in the manufacture and application of paints and allied products. IBPAT's efforts to protect the worker from occupational injury and illness are as old as the Brotherhood itself.

Ever since the early 1900's the IBPAT Journal has carried articles on the health and safety of workers. In the early days the problems were lead exposures and rigging and scaffolding. In recent years, with the growing number of new substances in the paint trades and with the complexity and immensity of jobs, the scope of Journal coverage has widened to include everything from the new plastics, resins, silica, asbestos, benzene and many other harmful substances to more sophisticated rigging and scaffolding techniques.

In 1974, IBPAT General President S. Frank Raftery declared a Decade of Job Safety, to step-up the attack on unsafe and unhealthy job conditions. Since then, IBPAT has participated in several scientific studies, most notably the Mount Sinai School of Medicine study completed in 1976.

The MSSM-NIOSH study made a comprehensive investigation of the health of almost 2,000 IBPAT members (including painters, tapers, floor tile workers, sandblasters, metal painters, paint makers and titanium dioxide manufacturers).

The IBPAT Health and Safety Education Book has been produced by IBPAT as an important part of the Brotherhood's long and comprehensive fight for a safe and healthful workplace.

The management associations of the trades, the National Paint and Coating Association, the Painting and Decorating Contractors of America, the international association of Wall and Ceiling Contractors, the Silica Sand Association and the Dry Colors Manufacturing Association, also take health and safety issues very seriously. In recent years these associations have worked to promote safety and health among painters and allied tradesworkers by conducting scientific studies at

their own expense and by joining with IBPAT in the formation of the National Joint Safety and Health Committee.

For these organizations, supporting IBPAT in the development of this training book is a logical extension of this labor-management cooperation.

The Federal Government is also very active in health and safety, especially since the passage of the Occupational Safety and Health Act of 1970. The OSH Act is a law passed by Congress and signed by the President in 1970. Prior safety and health legislation dealt only with individual industries or with particular classes of workers. For example, the Longshoremen's and Harbor Workers' Compensation Act of 1927, the Walsh-Healy Public Contracts Act of 1936, the Contract Work Hours and Safety Standards Act, as amended in 1969, and the Federal Mine Safety and Health Act of 1977. Out of this maze of Federal laws emerged the Occupational Safety and Health Act of 1970, which consolidated many of the previous safety and health laws into one comprehensive act.

The OSH Act covers nearly 5,000,000 workplaces and over 60,000,000 employees. The only group of workers excluded from coverage of the Federal safety and health legislation are public employees, although some of them are protected under OSHA-approved state health and safety laws.

The purpose of the Occupational Safety and Health Act is "... to assure so far as possible every working man and woman in this nation safe and healthful working conditions."

The sole aim of labor, management and government in designing this booklet is also yours: to reduce the number and severity of work-related illnesses and injuries suffered by painters and allied tradesworkers.

Why is there so much concern for occupational safety and health? How unsafe is the workplace? No doubt you have your own ideas. On the next page are 10 "facts" about workplace illnesses and injuries. Check the statements you think are true.

Which of the following 10 "facts" about workplace injuries and illnesses do you think are true? You can choose more than one.

___ 1. **Occupational deaths claim three times as many people as murder and twice the number auto accidents claim.**

___ 2. **More workers died from occupational injuries and illnesses in 1975 and 1976 than all the U.S. soldiers in Vietnam and Korea put together.**

___ 3. **More workers are killed yearly from occupational causes than the yearly estimate of Americans killed in W.W. II.**

___ 4. **Nearly 60,000 workers are killed yearly from work-related causes.**

___ 5. **Approximately 5 million workers yearly report a work-related illness or injury.**

___ 6. **Each year 400,000 workers suffer from occupational diseases.**

___ 7. **Each year one-in-every-eight workers can expect temporary or permanent disability from working.**

___ 8. **Lost-time from accidents in 1975 was 365 million days, over 10 times the amount lost from strikes.**

___ 9. **The cash cost from accidents in 1975 was 16 billion dollars.**

___10. **The dollar cost of accidents is equivalent to 1,600,000 jobs at $10,000 a year—enough to reduce unemployment by two percentage points.**

You may have decided that Numbers 1 and 7 are true, and they are. But so are 3 and 5 and 9. In fact, every "fact" in the manual is just that: fact.

The Facts

No-name hospital. One out of eight workers will stay here each year.

No-name hospital, Anywhere, U.S.A. This is the house that Jack, Joe, Tom, Bill, Larry and 95 other workers built. Today, eight of them are staying here.

Death and injury, lost time and wasted dollars are four facts of the unsafe workplace. These facts are constructed out of the toil of workers and employers. They lift each block and mortar it in place, walling themselves and America in with unwanted injury and illness.

Last year, occupational deaths claimed three times as many people as murder and twice the number auto accidents claimed. Two recent years of occupational deaths tally more than 16 years of fighting represented by the Korean War and the Vietnam conflict combined. Even W.W. II's average death of 51,000 Americans a year is below the yearly estimate of 60,000 occupationally related deaths—enough to wipe out an entire football stadium.

Another 5 million workers yearly report injury or illness sustained on the job. Many more don't bother to report their work-related injuries or illnesses.

Each year 400,000 workers suffer from occupational diseases, not to mention the harmful health effects on the general population from industrial pollution.

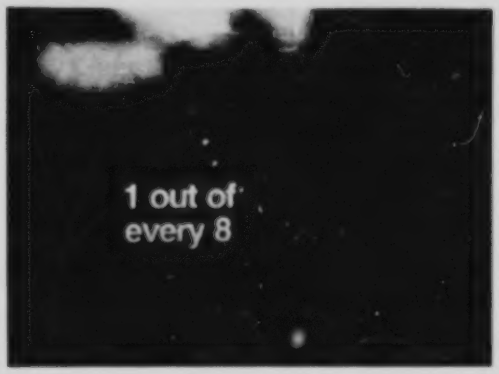
Each day American workers are walling themselves in with unwanted occupational illnesses and injuries.

For the 100 million pairs of shoes tramping through the work world, these grisly statistics mean trouble. One-out-of-every-eight workers can expect temporary or permanent disability from work-related injury or disease this year. In 10 years' time, the lives of few workers will remain untouched.

Death and injury from occupational causes also reduce our country's productivity, lower our standard of living and contribute to inflation. National Safety Council figures indicate our nation's inflation rate could be reduced about one-sixth by eliminating accidents.

Lost time from accidents and injuries in 1975 reached 365 million days; the equivalent of putting one million men and women on the bench for an entire year.

Lost time from workplace injuries and illnesses is over 10 times greater than lost time from strikes.



One out of every eight workers suffers an occupational injury or illness.

The cash cost of workplace accidents in 1975 reached 16 billion dollars, including 3.4 billion in lost wages and 1.9 billion in insurance costs. The 16 billion dollar cost of accidents is the equivalent of 1,600,000 jobs at $10,000 a year—enough to reduce unemployment by two percentage points. Further, these costs are paid by each of you, added into the cost of products, insurance and medical care. A single individual would have to work over a million years at $15,000 a year to pay this debt.

Death and injury, lost time and wasted money are the hard facts reported by scientific measuring tools of government, business and unions. Yearly, for all workers, 60 thousand killed, 5 million injured, 1 million worker-hours and 16 billion dollars lost. The facts tell us that we have problems in the workplace. And for every fact a real person suffers.

We have looked at the workers of our nation. Now let us look closer to home. Let us look at the facts for our tradesworkers: For General Painters, Floorcoverers and Paint Makers.

On the following pages are several questions to test your knowledge of the illnesses and injuries of your trade. Answer these questions now.

General Painters

1. Do you think General Painters lose more time, on the average, from work-related accidents than all other workers do?

   YES ____ NO ____

2. Which occupational diseases do you think Painters get? You can choose more than one.

   ___ a. Dermatitis

   ___ b. Bronchitis

   ___ c. Asbestosis

   ___ d. Silicosis

3. Which occupational injuries do you think happen most frequently to Painters? Number them in order from most frequent to least frequent.

   ___ a. Injuries from motor vehicle accidents

   ___ b. Strains from lifting or over-exertion

   ___ c. Burns from fires or torches

   ___ d. Injuries from falls

   ___ e. Injuries caused by blows from objects or by striking against objects.

Floorcoverers

1. Do you think Floorcoverers lose more time from work-related accidents on the average than all other workers do?
   YES ____ NO ____

2. Which occupational diseases do you think Floorcoverers get? You can choose more than one.

   ___ a. Dermatitis

   ___ b. Asbestosis

   ___ c. Bronchitis

   ___ d. Other_____

3. Which occupational injuries do you think happen most to Floorcoverers? Number them in order from most frequent to least frequent.

   ___ a. Injuries from motor vehicle accidents

   ___ b. Strains from lifting or over-exertion

   ___ c. Burns from fires or torches

   ___ d. Injuries from falls

   ___ e. Injuries caused by blows from objects or by striking against objects

   ___ f. Other_____

Paint Makers

1. **Do you think Paint Makers lose more time, on the average, from work-related accidents than all other workers do?**

   YES ____ NO ____

2. **Which occupational diseases do you think Paint Makers get? You can choose more than one.**

   ____ **a. Dermatitis**

   ____ **b. Bronchitis**

   ____ **c. Lead Poisoning**

   ____ **d. Cancer**

   ____ **e. Other**_____

3. **Which occupational injuries do you think happen most to Paint Makers? Number them in order from most frequent to least frequent.**

   ____ **a. Injuries from motor vehicle accidents**

   ____ **b. Strains from lifting or over-exertion**

   ____ **c. Burns from fires or hot surfaces**

   ____ **d. Injuries from falls**

   ____ **e. Injuries caused by blows from objects or by striking against objects**

   ____ **f. Other**_____

GENERAL PAINTERS

General Painters as a group fare much worse than most. Lost time from reported accidents, for example, is 100 percent higher for painters than for all other private businesses—that's twice as much.

Certain diseases, asbestosis, bronchitis, silicosis, also occur with great frequency among painters. Twenty-eight percent of the general painters surveyed by the Mount Sinai School of Medicine had chronic bronchitis.

A survey covering 1,100 reported worker compensation cases for general painters showed:

Over 37 percent of general painters' accidents are falls. Falls from scaffolds, falls from ladders, falls from roofs, falls into openings, falls from vehicles and falls from tripping. Falls, falls, falls and more falls. Falls from improperly erected scaffolds, falls unchecked by guardrails—because guardrails weren't in place, falls because ladders were not properly used and falls in which solvent-intoxication may have played a sinister role.

After falls, strains are the most common accident. Twenty-five percent of general painters' accidents are strains from lifting and carrying heavy objects, tools and materials. The majority of these strains are back strains. Many of these are from lifting and turning.

Next, after falls and strains, are injuries from objects striking the painter. Nails, tools, lines, ladders, buckets, bolts, probably even kitchen sinks! This accounts for about 24 percent of general painters' accidents.

Worker Compensation Survey
Injuries Reported by
General Painters

Falls	37%
Strains	25%
Blows	24%
Toxics	4%
Other	8%

Claims reported in California, Ohio and Washington.

The remaining 14 percent of general painters' accidents involve an assortment of circumstances: motor vehicle accidents, accidents from extreme temperatures, accidents from toxic substances, accidents from electrical contact, explosions, fires and crushing between objects or machinery.

FLOORCOVERERS

Floorcoverers as a group fare much worse than most. Lost time from reported accidents is 100 percent higher for floorcoverers than for all other private businesses—that's twice as much.

Respiratory diseases, such as bronchitis and asbestosis, occur with greater frequency among floorcoverers. Twenty-nine percent of the floorcoverers surveyed by the Mount Sinai School of Medicine had chronic bronchitis.

A survey covering 1,000 reported worker compensation cases for floorcoverers showed:

Over 34 percent of floorcoverers' accidents are from striking objects or objects striking floorcoverers. Your knee striking a kicker when a stretcher could be used; tools falling off scaffolding striking your head when toe boards and hard hats would have prevented a fractured skull; boxes striking and crushing your foot when safety shoes would have prevented the damage; knives striking your hand when cutting away from your body would have prevented the laceration; buffers and polishers striking your leg; this striking that, and that striking this, and you striking out!

After striking accidents, strains are most common. Thirty-four percent of floorcoverers' accidents involve strains. Strains from lifting and carrying heavy objects, heavy carpet, heavy tile boxes, tools and heavy equipment. Many of these strains are from lifting and turning.

Next, after striking accidents and strains, are falls: falls off ladders, falls down stairs, falls into holes and even falls over objects. This accounts for 20 percent of the accidents to floorcoverers.

Worker Compensation Survey
Injuries Reported by
Floorcoverers

Blows	35%
Strains	34%
Falls	20%
Caught In-Between	3%
Other	8%

Claims reported in California, Ohio and Washington.

The remaining 11 percent of floorcoverers' accidents involve an assortment of circumstances: motor vehicle accidents, accidents from extreme temperatures, accidents from toxic substances and mashing between objects and machinery.

PAINT MAKERS

Paint Makers as a group fare much worse than most. Reported accidents are 35 percent higher for paint makers than for all other private businesses.

Respiratory diseases, such as bronchitis, occur with greater frequency among paint makers than among other workers. Thirty-three percent of the paint makers surveyed by the Mount Sinai School of Medicine had chronic bronchitis.

A survey covering 1,000 reported workers compensation cases for paint maker employees showed:

Over 35 percent of paint makers' injuries are strains. Strains from carrying, strains from lifting, strains from pushing, strains from pulling and strains from moving equipment and materials. Strains, strains, strains and more strains. It's a real pain in the—back! Strains from lifting boxes alone when co-workers can help; strains from moving barrels and drums by hand when proper equipment is available; strains from moving pallets when a forklift is idle; strains from lifting cartons improperly when the bent-knee, straight-back method could have *easily* been used; strains from this and strains from that. Give your back a break.

After strains, injuries from objects striking you — the paint maker — are the most common accidents. Twenty-seven percent of paint makers' accidents involve being struck by some object—bricks, pallets, knives, boxes, barrels and tools. Falling objects can do you in—permanently.

Next, after strains and being struck, are injuries from falls: falls off ladders, falls down stairs, falls over objects and falls into holes. Falls account for 14 percent of paint makers' accidents.

Worker Compensation Survey
Injuries Reported by
Paint Makers

Strains	35%
Blows	27%
Falls	14%
Caught In-Between	10%
Other	14%

Claims reported in California, Ohio and Washington.

The remaining 24 percent of the accidents involve an assortment of circumstances: motor vehicle accidents; accidents from extreme temperatures; accidents from toxic substances; accidents from electrical contact, explosions and fire; and mashing between objects and machinery.

We have always known that work in the paint trades is dangerous. Painters consistently rank among the top five trades in worker compensation payments.

More recent scientific studies conducted through the cooperative efforts of labor, management, government and the scientific community—for example, the MSSM report—have defined the extent, nature and causes of many illnesses and injuries suffered by painters and allied tradesworkers. These studies give form to the possibility of reducing accidents and the resulting illnesses and injuries by making information available directly to the workers. Some of this information is not new, such as the hazards associated with lead paint. Some that is very important is new, such as the cancer-causing effects of benzene, a solvent used in the paint trades. But all of it has been gathered together here for the first time to be given to you, because you have a right to know and a responsibility to act. This information can prevent serious injuries and illnesses and save lives. Must it be said that one of them may be your own?

Suspended from great heights, IBPAT members work hard to maintain America's structures.

An IBPAT-OSHA seminar participant discovers hazards of the paint and allied trades.

Day to day the responsibility for safe and healthful workplaces is shared by employers and employees. The employers' voluntary compliances with the OSH Act, along with the tradesworkers' ability to recognize, evaluate and avoid hazards in the work environment are the best guarantees for reducing accidental deaths, injuries and illnesses in the paint trades.

HEALTH HAZARDS

For centuries upon centuries upon centuries, before the industrial revolution of the 1700's, human beings lived and *worked* in an environment free of the chemical pollutants introduced in recent years.

The problems of survival were food shortages, wild animals, other people and disease.

Prior to the industrial revolution, food shortages, wild animals, other people and disease were the problems of survival.

The industrial revolution began a totally new way of living for most of the human beings on earth.

The production of goods increased tremendously. More and more people own possessions enjoyed only by the very rich just a few decades before. And, of course, new products came to exist which our ancestors could not have imagined.

Most of us agree: life is easier now, and we enjoy greater rewards for our toil than ever before.

But, more and more we realize this great social and economic progress includes new dangers. Dangers that did not exist for your great-grandparents.

In the paint and allied trades, the last 50 years have seen revolutionary changes in the products of the trades and in the techniques for making and using these products.

Some of the ingredients in paints have only now been in use long enough for their harmful effects to become visible. And the harmful effects of many of the newer ingredients in paints and allied products have yet to be discovered.

It is a sad fact that many of these ingredients have never been adequately tested. For years, working people have been and still are making, packaging and using many untested substances.

The industrial revolution created many new health hazards, such as those encountered by this paint maker in the early 1900's.

Only a small number of the substances used in the paint and allied trades are well known and understood for the harm they cause.

Lead, for example, is the oldest health hazard of the paint trades.

Its use goes back to the time of the ancient Egyptians.

And cases of lead poisoning have occurred throughout history. Even Pliny the Elder of ancient Rome recorded the use of a loose-fitting animal bladder respirator in Roman mines to protect against inhalation of red oxide of lead.

Although the use of lead paint has been restricted in many countries, the lead hazard still exists in the paint trades.

Many other substances do not date back to ancient Egypt.

Nitrocellulose, for example, is a synthesized plastic widely used in spray paints. Nitrocellulose was developed in the mid-1800's and became an established commercial product a couple of decades later.

It is now widely known that nitrocellulose can be a hazard to health, if it is not handled properly.

Unfortunately, although the hazards of nitrocellulose are known, painters still suffer illnesses from exposure to it because proper procedures and protective equipment are not used when nitrocellulose is applied.

Still other ingredients found in paint and allied products did not exist before the 20th century.

Primitive respirators like this one were used to protect workers from health hazards in the early 1800's.

Polyvinyl chloride or PVC, for example, was developed during the 1930's and became widely used during the 1940's —only a few decades ago.

Why were PVC and other synthetic products introduced into the workplace without first discovering whether they might be harmful to working people? What do you think? Below are four possible reasons why new chemicals were introduced into the workplace without adequate testing. Check the ones you think are right.

20

Following are four possible reasons why new chemical substances were introduced into the workplace without adequate testing. Check the ones you think are right.

___ **a. There was not always enough TIME to test every new chemical substance. Some chemical substances were needed immediately, as happened during World War II, for example.**

___ **b. Employers often DID NOT KNOW that some chemical substances are harmful.**

___ **c. The GOVERNMENT's ability to protect workers was not widely established.**

___ **d. Research of the effects of exposure to chemical substances is EXPENSIVE and often there was not enough money available.**

Why were new chemicals introduced into the workplace without adequate testing?

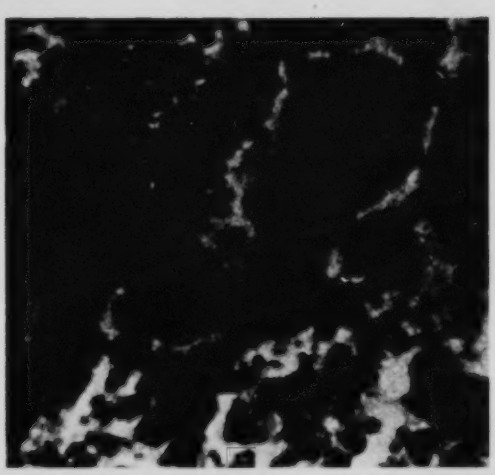
Well, consider the case of lead. We know that 2,000 years of "field testing" throughout history demonstrated its harmful effects. While it does not take 2,000 years to prove that a substance is harmful to human beings, it does take time. Experiments with laboratory animals must be performed. The research is very complicated and very time-consuming. So if you think TIME is one of the reasons, you are right.

With so many substances introduced since World War II, people had no real reason to suspect many are harmful to those who work with them. And most people were more interested in the new benefits these substances bring than in the possibility they might be hazardous to the people who work with them.

Some harmful effects take many years to develop. Cancers caused by exposure to asbestos and vinyl chloride may not develop for 13 to 30 years. In the meantime, millions of workers handled dangerous substances for years without protective equipment — never suspecting these substances harmed their health and diminished the quality of their lives.

Why have employers allowed workers to handle dangerous substances without proper protection? If you said this happens because employers often DO NOT KNOW these substances are harmful, you are right.

Many employers have not known that some products used by their employees are harmful.



Asbestosis under the microscope: a disabling occupational illness caused by exposure to asbestos. Asbestosis is a significant problem for drywall tapers and floorcoverers.

Often, employers do not know what the chemical contents of raw materials used in making products really are. Workers relied upon their employers to warn them about hazards in their workplace. In turn, the employers relied upon manufacturers to warn them about hazards in the products workers handle. And very often the manufacturers themselves did not know the materials they sold were harmful.

While it is true that some employers have been negligent in allowing workers to work with hazardous substances without warning or protection, most employers are very concerned about the health and well being of employees and will go a long way to help protect the people who work for them.

Why has the government allowed people to work with substances that can be harmful to their health? Again, the harmful effects of some of these substances were not known until recently. But also, if you said that the GOVERNMENT's ability to protect the worker was not established, you are right. The government's ability to intervene for the protection of working people was not widely established until the passage of the Occupational Safety and Health Act of 1970.

Because these new substances are an important part of modern life, we cannot simply give up all of them because some of them may be hazardous. As Nobel Prize-winning chemist Ilya Prigogine has said, "chemistry is not just a way of polluting the atmosphere." Giving up all these new substances would mean the loss of many things that are important to us —economically, physically and for our own personal comfort.

Instead, we must find out which new substances are harmful and to what degree. The job of discovering which substances are harmful is the manufacturers' — those firms that develop the substances.

Scientific research on animals is vital if we are to determine the harmful effects of chemical and physical agents. But testing takes time.

Often this job is shared by other organizations: medical schools, the government, the trade and manufacturing associations, consumer groups and trade unions—and to an important extent, by the people who work with the substances.

A great deal of research must still be done before we will know for certain what the biological effects of all of our modern substances really are. Fifteen thousand chemical substances are in common use throughout the United States.

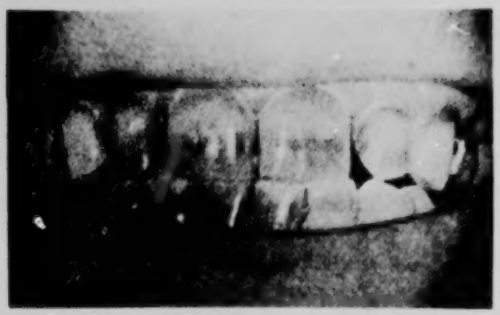
And 3,000 new substances enter the workplace each and every year. Scientific research is very costly. So if you said that new substances were introduced into the workplace without adequate testing because it is too EXPENSIVE, you are right. All four of the reasons given in your manual are correct.

Until all the necessary research has been done, we must recognize the possibility that a substance which we work with every day may be harmful.

In a few cases, scientific research has already told us much about the effects of a particular hazardous substance. For example, acetic acid, used in the manufacture of paint, is known to be less harmful than lead. The effects of exposure to acetic acid include irritation of the trachea and bronchial tubes, nose, throat and lung tissue and irritation of the eyes and skin.

Perforated septum of the nose is one adverse effect from exposure to chromates.

These are not desirable effects, but they are less serious than those of other substances. Chromates, for example, used in paint manufacturing, are very harmful. Chromates are known to cause discoloration of the tongue and teeth and perforated septum in the nose. Lung cancer among workers who have handled the raw chromates has also been observed.

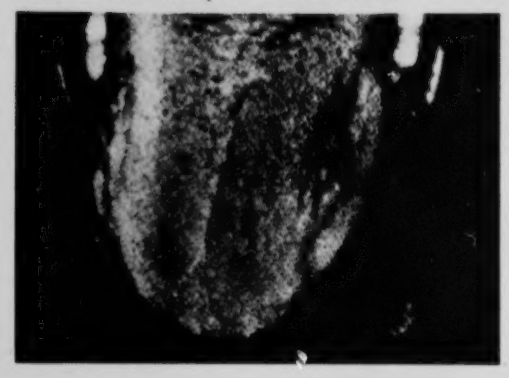


Discoloration of the teeth . . .

How can you tell whether any of the substances you work with are harmful?

In Appendix III (page 18) is a chart listing the most commonly used substances of the paint and allied trades, along with effects known to result from exposure to them. Look at this chart and try to find the name of any substance you work with. Then check to see what the known effects from exposure to it are.

. . . and discoloration of the tongue are other adverse effects from exposure to chromates.



You probably see many substances in the chart you don't recognize. If you take the chart with you to your jobsite, you can check the labels of products you use and compare the ingredients with substances listed in your chart. Many labels you check will not list any chemical ingredients. So how can you tell whether the products you use contain any of these substances?

You must ask.

Ask your job supervisor. Ask your employer. Ask your business agent. Give them time to answer you. If they can't answer you, then ask the manufacturer. Write a letter to the manufacturer giving the name of the product and ask what substances it contains.

Let's say that one of the people you ask gives you an answer. Let's suppose they tell you the product contains a substance that is not listed on the chart. How can you tell whether or not it is harmful?

You can write a letter to the International Brotherhood of Painters and Allied Trades, 1750 New York Ave., N.W., Washington, D.C., or to one of the trade associations. The people there will try to find the answer for you.

But what if the substance contained in the product you use has not been adequately researched or tested; that is, we do not know yet what the effects of this substance might be. Are you back where you started from?

Well, not quite.

It is always better to be safe than sorry. So, unless you learn for certain that the products you handle in your daily work are completely and totally safe, you must protect yourself from exposure to these substances. Don't assume automatically that a substance is safe. Many workers who made that assumption in the past are irrevocably sorry now. It is better to be safe, and most of the time it's just as easy.

How can you protect yourself from exposure to a hazardous substance? It depends on the manner in which you are exposed.

There are three main ways in which hazardous substances enter your body. Do you know what they are? Following are nine possible answers. Check the ones you think are right.

Lung cancer is the most serious effect from chromate exposure.

There are three main ways in which hazardous substances enter your body. Do you know what they are? Choose the answers you think are correct.

Hazardous substances may enter your body through:

___ a. The airline of your supplied-air respirator

___ b. Inhalation

___ c. Your lunch

___ d. Neoprene gloves

___ e. Skin absorption

___ f. Your dust respirator

___ g. Ingestion

___ h. Holes in protective gloves, shirts and pants

___ i. Smoking a cigarette

First, hazardous substances enter your body through INHALATION. This means the hazardous substance enters your body through your nose or mouth when you breathe. This is the most common form of exposure to hazardous substances. This happens when the hazardous substance is in the air in the form of gases, fumes, mists, vapors, dust or particulates. Damage from inhaling toxic substances does not end with your nose and lungs. The toxic substance in your lungs can be absorbed by the blood and sent to other organs where damage may occur.

If you said hazardous substances may enter your body through the airline in your air-fed respirator, you could be right. If the inlet to the compressor is in a contaminated environment, or if the compressor is not properly maintained, hazardous substances may enter your air supply.

Hazardous substances can also enter your body through your dust respirator. Your dust respirator is only good for substances such as asbestos or silica. If you are working with organic solvents, your dust respirator is no good! The main idea to remember is that the harmful substance enters your body through inhalation; i.e., breathing. The contaminated air supply line and improperly used dust respirator are only cases of hazardous substances entering the body through inhalation.

Inhalation, the most common route of exposure to harmful substances, occurs when harmful substances are present in the air you are breathing.

Skin Abeorption: hazardous substances passing through your skin into your body. Washing with solvent is prohibited.

The second main way in which exposure to a hazardous substance happens is through SKIN ABSORPTION. The hazardous substance enters your body through your skin, when the hazardous substance comes into direct contact with your skin; for example, spray paint that collects on exposed arms. Some people think hazardous substances cannot penetrate the skin and that it is not harmful to allow paints or other products to accumulate on the skin. This is a very dangerous assumption. The skin absorbs many substances and they pass right through it into your bloodstream.

You might have thought hazardous substances could never enter your body through neoprene gloves. If you thought so, you are wrong. Neoprene gloves are no match for chlorinated hydrocarbons, such as methylene chloride—they'll dissolve in it. If handling chlorinated hydrocarbons, use polyvinyl alcohol gloves. They'll work.

In addition, if you said hazardous substances can enter your body through holes in protective gloves, shirts and pants, you are correct. Personal protective equipment must be properly maintained to be effective against hazards. The point to remember, though, is that hazardous substances can and do enter your body right through your skin—skin absorption.

The third main way in which exposure to a hazardous substance happens is through INGESTION. This means the hazardous substance enters your body through your nose or mouth and is swallowed. We saw how such exposure affected people who worked with chromates. Once the substance enters your stomach, it can damage the stomach or pass into your bloodstream to attack vital organs. In other words, you have eaten a hazardous substance.

Ingestion: Wash before eating because the substances on your hands can get on your food and be swallowed.

You can also swallow a hazardous substance after you inhale it. Mucus coughed up from your lungs carries some of the hazardous substance into your mouth where it may be swallowed (ingested).

Probably most of you thought a hazardous substance couldn't enter your body through your lunch. Well, you're right—most of the time. But leaving your lunch around your worksite allows contaminants to settle on the food which is eaten by you. Also, if you don't thoroughly wash your hands before eating lunch or smoking a cigarette, hazardous substances can pass from your hands to the food or cigarette, then to your mouth and stomach. But remember, the hazardous substance entered your body through ingestion, or swallowing.

These then are the three main ways in which hazardous substances enter your body: Inhalation. Skin absorption. Ingestion.

A fourth route of exposure also exists which is rarely discussed. Noise, vibration, heat, cold and radiation, although not substances, are hazards to health commonly encountered in your workplace. Noise, vibration, heat, cold and radiation may affect a single organ in the way noise affects the ears, for example. But these hazards also harm your entire body—your circulatory, digestive, skeletal and muscular systems. This is called the "whole body phenomenon." Your body's response to these hazards, especially noise and vibration, may be stress and fatigue — two conditions that make your job harder and increase the probability of an accident.

We've seen that hazardous substances enter your body through inhalation, skin absorption, ingestion and the whole body phenomenon.

You have inhaled a hazardous substance or it has been absorbed through your skin or you have ingested it. What happens once the hazardous substance enters your body? It depends on four things. Do you know what they are? Below are six possible answers. Only four are correct. Check the ones you think are right.

The harmful effects a hazardous substance has on your body depend on four things. Check the four items you think are correct.

___ 1. The odor of the substance.

___ 2. The physical state of the substance.

___ 3. The color of the substance.

___ 4. The nature of the substance.

___ 5. The concentration or dose of the substance.

___ 6. The duration or length of your exposure to the substance.

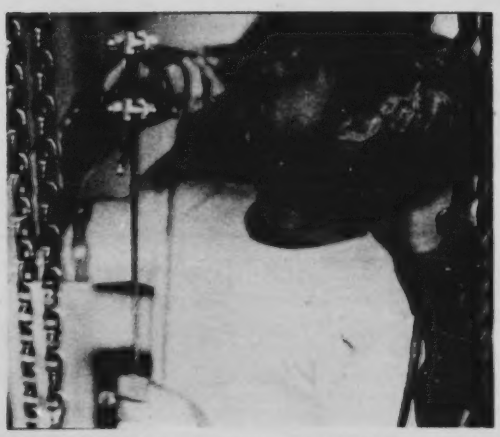
If you chose Number 4, the nature of the substance, you are right. The effect of the hazardous substance depends upon its chemical structure or its nature.

In the paint and allied trades, you encounter many substances every day. Have you noticed some make your eyes water and some make you high while others make your skin crawl, make you nervous or upset your stomach? This is because of the nature of the substance. Like cats, dogs, trees, rocks or people, every substance has a nature.

You cannot determine what substance will be most harmful to you merely by its immediate effects. Nor do you want to, any more than you would like to have a tiger take a bite from your back-hind or to sit in a patch of poison ivy to compare its effects with the poison oak you stepped in the week before or to eat nails to prove you have a cast iron stomach.

Some substances that cause very irritating immediate effects, such as the coughing, sneezing, wheezing and lightheadedness associated with styrene, are less harmful than others that appear to have no immediate effect, such as asbestos which in the long run can cause cancer.

If you don't know the nature of the substance you work with, don't use yourself as a guinea pig to try to find out. If you are not a chemist, then your best bet is to protect against all substances you work with as though they are hazardous to your health.



Some hazardous substances cause irritating effects, such as coughing. But adverse effects from other hazardous substances may not show up for years—when it's too late.

The physical state of the substance, Number 2, also determines its effects on your body. And physical state determines the form of protection you will need as well. There is not much danger of inhaling a 500-pound block of concrete. But vapors, mists, gases and fumes can be and are inhaled. So you will want to prevent them from entering your breathing zone. Some vapors and mists irritate the skin and the eyes. Many liquids will irritate the eyes. And while inhaling liquids is not very common, they can still get into your body by swallowing them or by absorbing them through your skin.

The state of substances can change. This changes the protection you need. A solid strip of seaming tape is safe until heat changes its physical state. Then isocyanates are released as gases which can be inhaled, irritating the airways. The haz-

ards of many liquid solvents increase when they vaporize into the air. The danger of asbestos fibers is reduced by mixing them in a liquid solution that prevents them from becoming airborne. So, the harmful effect of a substance can be increased or decreased by changing its physical state.

Pre-mixed spackle is an engineering control that reduces your exposure to silica and asbestos in the mixing process.

How about Number 5, the concentration or dose of the hazardous substances? Concentration (dose) determines how much of the hazardous substance enters your body during one exposure. Think of sleeping pills. One pill at night may not do you much harm, but taking the whole bottle at once could kill you.

The duration or length of your exposure also determines how much of the hazardous substance enters your body. The longer the exposure the greater the hazard. Therefore, if you chose Number 6, duration or length of exposure, you are correct. Usually dose and duration are combined to measure total exposure.

The physical state of a substance, its nature and the dose and duration of your exposure to it all determine the harmful effects a substance may have on your body.

How do you know whether a substance you work with may be harming your body? Read "Exposure to Occupational Health Hazards" and find out.

EXPOSURE TO OCCUPATIONAL HEALTH HAZARDS

The nature, physical state, concentration and duration of exposure to hazardous substances all determine the harmful effect contaminants have on your body. But how can you tell when you are exposed to harmful substances?

Some contaminants have a distinct odor — you know you are exposed to them because you can smell them. But your sense of smell is not foolproof. No one should rely completely on smell to detect harmful substances.

Some hazardous substances tire out the olfactory nerves in your nose, those nerves sensitive to odors. After a few days, hours or even minutes, your nose loses its ability to detect the odor — even though the harmful substance is still present. This is called olfactory fatigue.

On the other hand, some very dangerous substances, such as benzene, actually have a pleasant odor. Benzene smells good but it's deadly, while toluene — a safer substitute for benzene — smells terrible!

Finally, some hazardous substances have no odor at all. Carbon monoxide is a good example. You can't see carbon monoxide. You can't taste it. Nor can you smell it. But, although it can't be detected by the senses, carbon monoxide is a killer.

Even with these limitations, your nose can still provide some warning. When a substance irritates your nose, you can be sure it will irritate your throat and lungs too.

How else can you detect exposure to contaminants? Sometimes you can see them or taste them. Sight and taste can be indicators of exposure, but again they are not always reliable. Dust "clouds" near abrasive blasting indicate exposure to silica. Dust "clouds" near drywall taping can indicate asbestos or silica exposure. Your senses are helpful but not foolproof. Solvents, for example, produce no visible "clouds." Many substances can only be detected by sophisticated equipment.

You can also determine exposure by watching your coworkers. Look at the new employees who come on the job — the young people. Are you proud of thinking you're a lot tougher than they are? Does it seem to take a few months or a year before they can stand the kind of situations you are used to? What this really means is you have temporarily succeeded in overcoming your body's natural tendency to avoid unhealthy substances. You may be exposing yourself needlessly to something not only unpleasant but permanently damaging to your body in the long run. Symptoms ex-

perienced by the newcomers warn you that you are also exposed to something unhealthy.

Do you find that many new workers drop out? Is it true that only one out of four new employees, or one of three, can cut the mustard, so to speak, and last in the job while the others drop out because of the unpleasant circumstances? This could be another warning sign. Do the new people cough up blood or get nose bleeds? Again, it is not enough just to chuckle at their discomfort. You should also think about your own situation.

How about the old timers? Do they all seem abnormally short of breath for people their age? Can they still get up the ladders? Can they still climb a flight of steps? The Bible says we get three score and ten; that's 70 years. Under normal circumstances, much of your natural vitality should stay with you up to the last few years. If fifty-year-olds and fifty-five-year olds can't climb a flight of steps without panting, there's something wrong.

Your health and the health of others can provide clues to occupational exposures.

How about cancer? Everyone is afraid of cancer, but most people don't know much about it. Certain types of cancer are very, very common: lung cancer, cancer of the colon and rectum, breast cancer and others. But suppose somebody in your workplace gets a very unusual kind of cancer. Or suppose two people in your workplace both get a very unusual kind of cancer. This situation calls for concern and investigation. For instance, the dangers of asbestos first came to attention when it was noticed that several cases of mesothelioma, otherwise a very, very rare cancer, occurred in people exposed to asbestos. The danger of vinyl chloride was discovered in the same way. Vinyl chloride causes an otherwise very, very rare cancer of the liver, known as hemangiosarcoma. Now how many people have ever heard of that cancer? Very few. Because it is extremely rare. So if one or two cases of such an unusual cancer occur in your workplace, that is a warning sign. Perhaps it is time to ask for help.

Routes of Exposure

Inhalation is the most common route of entry for hazardous substances. When contaminants are in the air as gases, vapors, mists, fumes and particulates, they enter your respiratory system as you inhale.

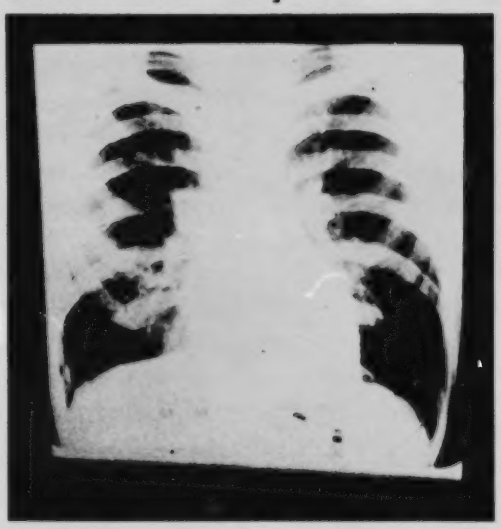
Your respiratory system brings oxygen into your lungs through the trachea and bronchi. The oxygen then goes to very small air sacs, surrounded by tiny blood vessels known as capillaries. From the air sacs, the oxygen passes into the capillaries and travels to all parts of your body where it is needed.

Before the air reaches the air sacs in your lungs, it must be cleaned. Nasal hairs and the wet mucous surfaces of the bronchi stop a portion of contaminants. In your lungs, tiny hairs called cilia move contaminants up and out into your throat where mucous is swallowed or spit out. Most contaminants that enter your respiratory system are removed this way — but not all. The contaminants that remain can do great harm.

Some contaminants, such as sulfur dioxide, chlorine, ammonia and some acids and bases, cause acute reactions. Acute reactions are rapid and severe reactions immediately following exposure. Exposure to sulfur dioxide causes coughing and gasping — an acute reaction. The coughing and gasping warn you to leave the area immediately before more serious harm occurs.

Chlorine causes a different type of acute reaction. As you inhale, it goes deep into the lungs to damage the air sacs. The air sacs protect themselves by filling with fluid, which dilutes the chlorine but also prevents oxygen from entering the blood. This can be fatal. The flooding of the air sacs is a kind of drowning known as pulmonary edema. The excess fluid in the lungs also provides an excellent breeding ground for viral infections and pneumonia.

Other contaminants, such as silica or asbestos, cause chronic illnesses. Chronic illnesses are persistent and drawn-out and take long periods to develop — often months or years.



Chronic lung diseases, such as pulmonary fibrosis, take years to develop and, oftentimes, are irreversible.

Silica, asbestos and other particulates cause pulmonary fibrosis, a chronic illness. Pulmonary fibro*sis* caused by silica is known as silico*sis* and when caused by asbestos is known as asbesto*sis*. Contaminants such as silica and asbestos cannot be

The air sacs of the lungs can be scarred from asbestos or silica, or broken down by chemical action.

destroyed or broken down by the lungs. Since they can't destroy asbestos fibers or silica particles, the lungs build fibrous scar tissue around the contaminant. This thick and inflexible scar tissue prevents adequate air transfer from the air sacs to the blood vessels. In addition, the scar tissue restricts breathing since the lungs cannot expand and contract easily. Pulmonary fibrosis is irreversible. Abrasive blasting and drywall taping are two major sources of exposure to silica for painters and allied tradesworkers. Sanding asbestos-backed tile and drywall taping are two major sources of exposure to asbestos.

Bronchitis and emphysema are two other chronic illnesses common in the paint and allied trades.

Chronic bronchitis is excessive mucous production in your respiratory tract caused by contaminants such as cigarette smoke, sulfur dioxide, asbestos and silica. The more irritants, the more mucous. The excessive mucous is an excellent breeding ground for infectious diseases, such as tuberculosis. One sign of chronic bronchitis is a persistent cough.

A health study of paint and allied tradesworkers by Dr. Irving J. Selikoff of Mount Sinai School of Medicine revealed that three of ten examined workers in the paint trades have chronic bronchitis. Nearly four in ten abrasive blasters have chronic bronchitis. And approximately 28 percent of the general painters exhibited chronic bronchitis. Even painters and allied tradesworkers who had never smoked had an unusually high rate of chronic bronchitis—11 to 14 percent.

Chronic bronchitis can lead to emphysema. Emphysema is a breakdown of the air sacs in the lungs. Excessive mucus production restricts the air flow through small air passages in the lungs, building up pressure in the air sacs. This pressure causes the air sacs to overexpand and even to break. The enlarged or broken air sacs restrict the flow of oxygen and carbon dioxide between the air sacs and the blood. The tell-tale signs of chronic emphysema are shortness of breath, shallow breathing, coughing and increased mucus production.

Lung cancer is another chronic illness encountered in the paint and allied trades. Several substances, such as asbestos and chromates, cause lung cancer. Also, substances that cause lung cancer can also cause cancer in other parts of the body, such as the stomach or colon.

How do you know if you have inhaled a harmful substance? A "yes" answer to the following questions is a strong indication that contaminants have entered your respiratory system.

Do large numbers of people in your workplace have a cough that produces phlegm? Is this true even of the ones who don't smoke? If so, this is not normal. If you cough up phlegm, does it have the same color as the materials you are working with? When you blow your nose, does it look like the material you are working with? If so, then whatever that material is, it is getting into your respiratory system. Who's to say that over the course of years this may not prove harmful to you? Do the substances you work with give you a sore throat by the end of the day? Do they make you cough all day long? These are warning signs.

Chronic lung diseases such as fibrosis, bronchitis and emphysema also affect the heart. Scar tissue in the lungs restricts the flow of blood, which in turn causes the heart to work harder and wear out faster than normal. Other problems may also develop from chronic lung diseases. Fibrosis, bronchitis and emphysema impede the flow of oxygen from the air sacs to the bloodstream, thereby damaging other organs by a lack of oxygen.

A contaminant, once it enters your respiratory system, can do two things. The contaminant can remain in your lungs and damage them, like silica and asbestos. Or the contaminant can transfer into the bloodstream with the oxygen to damage other parts of your body.

The oxygen-carrying ability of your blood is its most important function. Many toxic substances you are exposed to interfere with the process of transporting oxygen. For instance, carbon monoxide is absorbed more readily by the blood than oxygen. However, unlike oxygen, carbon monoxide is useless to your body's cells. If you work in a high concentration of carbon monoxide and do not have a proper respirator, you will be poisoned by the carbon monoxide. The first signs of carbon monoxide poisoning are headache, dizziness, nausea and vomiting. Continued exposure results in narcosis and death. Remember, carbon monoxide is produced by internal combustion engines. If you are to enter a confined environment where carbon monoxide may exist, ask your employer to sample for carbon monoxide. Only the sample will determine if carbon monoxide is present.

Other substances damage the blood cells and affect the

formation of these cells. Lead and benzene are two examples. A worker exposed to benzene or lead suffers weakness, fatigue, headache and looks pale. This condition is known as anemia. Anemia is one of the first signs of damage to your circulatory system.

Anemia, one of the first signs of circulatory system damage, can be caused by many solvents such as benzene and toluene.

White blood cells and red blood cells are produced in the bone marrow. Substances such as benzene damage the bone marrow. The bone marrow first loses its ability to produce red blood cells, thereby causing anemia.

How many members of your local have been told they are anemic? Perhaps they have even been given iron to remedy the anemia. Anemia simply means a low blood count. But what caused this low blood count? Frequently, the cause is not investigated. But it should be investigated because it is not normal for an adult to be anemic. This is of particular concern to painters because anemia is one of the first signs of the very serious and often fatal effects of benzene. Benzene exposure can also cause the bone marrow to produce cancerous white blood cells. Eventually, these cancerous cells replace all normal white blood cells. The formation of cancerous cells in the blood is called leukemia. It is eventually fatal.

Probably two million workers in the United States are still exposed to benzene. And painters rate high on that list. Why? Because in the past—and sometimes still today—benzene has been a component of many of the solvents you use. So if you have two or three tradesworkers, or even one who has been diagnosed as anemic, there is very good reason to find out why.

Danger to your body from toxic substances is not confined to your respiratory and circulatory systems. Depending upon the *nature* of the harmful substance, other vital organs, especially your kidneys and liver, can be damaged.

Kidneys, a key component in your body's filtering system, are damaged by substances such as lead, alcohols and carbon tetrachloride.

Kidneys filter waste products and some toxic substances from the blood. Your kidneys are especially vulnerable to harmful substances, and many substances directly cause kidney damage. Such substances are lead, mercury, carbon tetrachloride, tetrachloroethane and cadmium.

Kidney damage may be found by a urinalysis, blood test, blood pressure check and an x-ray. If you suspect kidney damage, explain to your doctor—very carefully—what type of work you do and what substances are used in the process. Those two facts, what type of work and what substances are used, can lead your doctor to a proper diagnosis.

Many kidney problems are non-specific; that is, your description of the symptoms will not lead your doctor to the illness. Malfunction of the kidneys can result in low or high blood pressure and too much or too little sodium, potassium, magnesium, calcium, chloride or nitrogen in the blood. The wrong amount of these substances in the blood in turn affects other organs of the body such as the heart or lungs.

Do several of your co-workers have blood in their urine? When this happens, a person is often told there is an infection in the urine because this is a common occurrence. But blood in the urine can mean other things, such as kidney damage. Perhaps it is time to have a careful and thorough investigation of your co-workers and workplace.

The liver is another organ damaged by toxic substances. The liver acts as a miniature chemical factory – breaking down some chemicals such as foods and building other chemicals such as proteins. The liver also acts to reduce toxic substances in your blood into harmless chemicals. But it does not always succeed.

A damaged liver fails to break down all toxic substances. After continued exposure, toxic substances build up in the blood and damage other systems and organs. Jaundice, a yellowing of the skin, is a symptom of liver disease.

Hepatitis, inflammation of the liver, is a common liver disease caused by exposure to viruses or toxic substances such as carbon tetrachloride, vinyl chloride, styrene and trichloroethylene. A mild case of hepatitis will probably heal without any lasting harmful effects on the liver. However, repeated cases of hepatitis lead to cirrhosis of the liver, a form of liver scarring. A scarred liver cannot properly and efficiently break down toxic substances. Liver malfunctions can be diagnosed by a blood analysis.

When someone has a liver problem, the first suspect is booze. But alcohol is not the only chemical that will damage your liver. There are many. Unfortunately, when someone develops a disorder of the liver, a doctor frequently assumes that it is only due to alcohol and tells the patient to cut down the drinking. But, possibly, the real culprit is a chemical in the workplace. So keep a mental note of how many people in your workplace or in your local have been told they have cirrhosis or jaundice or yellow jaundice or hepatitis. Do you have three or four such people? And is only one of them actual-

ly a heavy drinker? If so, then you should seek professional help.

Some hazardous substances, such as alcohols, ketones, ethers and lead compounds, directly affect the nervous system.

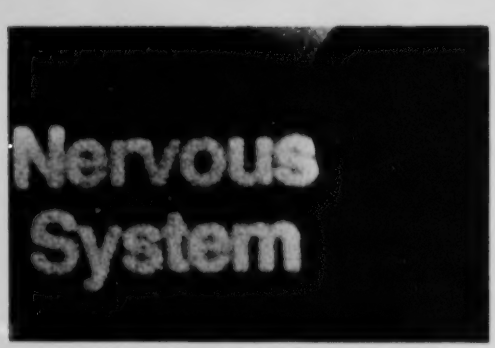
Your nervous system has many functions. For example, it stimulates all your movements, regulates your heart beat, tells you when you are hungry, tells you if it's too hot or cold. In short, it is the control center of your body, receiving and transmitting messages.

Your nervous system consists of two parts: (1) the central nervous system, made up of the brain and spinal cord; and (2) the peripheral nervous system, made up of the nerves that extend from the central nervous system to all parts of the body.

Damage to your central nervous system is permanent. The brain and spinal cord, unlike other organs of the body, cannot repair themselves. Damage to the peripheral nervous system can be repaired depending on the type and extent of damage.

To function properly, your brain must have a constant supply of oxygen. Your blood brings oxygen to the brain. Lack of oxygen from an oxygen deficient atmosphere or an atmosphere with high levels of toxic substances kills brain cells.

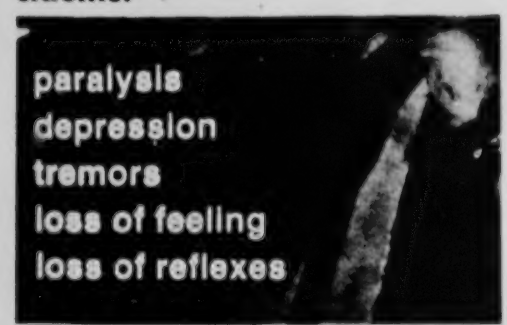
The effects of toxic substances on your nervous system may be paralysis, depression,



Your nervous system may be the first part of your body to detect a hazardous substance.

tremors, loss of feeling and loss of reflexes.

The health study of painters and allied tradesworkers by the Mount Sinai School of Medicine found reflexes of painters exposed to organic solvents, such as benzene, ketones and toluene, are slower than expected. Slowed reaction time means painters have a greater likelihood of experiencing accidents.



These are only some of the ways your nervous system reacts to hazardous substances; others are drowsiness and dizziness.

The first sign of exposure to a toxic substance may be dizziness or drowsiness. This is a warning that a hazardous substance may be present. You should leave the hazardous area or remove the hazardous substance before permanent and more serious damage occurs.

It is humorous to some painters that many solvents make you high. How much do you know about the long-term effects of this highness? The fact is we know quite well that alcohol, which also makes you high, can seriously damage a person's brain. So it's very possible that the long-term effects of solvents that make you high are similarly damaging. Do the old timers you work with seem to have very poor memories for people their age? Do many of them seem unusually irritable or bad tempered compared to people in other lines of work? Do they react slowly or are they unable to learn new information easily? These could be warning signs.

Solvent intoxication, a nervous system reaction to solvent exposure, can lead to accidents, such as falls.

Disorders of the nervous system can be detected in medical examinations which include reflex tests. Your doctor may diagnose more serious problems of the nervous system by spinal tap, the removal of some of the liquid surrounding the spinal cord. This liquid is examined for chemical abnormalities which may lead the doctor to the cause of the problem.

Damage to your body from toxic substances is not confined to your respiratory and circulatory systems, your kidneys or liver or to your central nervous system. Other organs, such as your pancreas and spleen can be damaged.

Most toxic substances enter your body through inhalation. But not all! Some enter through skin absorption. And some enter through ingestion. Once a hazardous substance enters your blood through inhalation, skin absorption or ingestion, damage to any other organ of the body may occur.

Dermatitis is the most often reported occupational illness. Dermatitis is a reddening and inflammation of the skin caused by exposure to oils, solvents, chemicals and other toxic substances.

Your skin has two layers. The outside layer is densely packed with cells. As the older cells die, they are pushed to the surface and eventually flake off. The outer layer contains a protein which generally protects the skin from chemicals, dusts and germs.

The inner layer of skin is fat and connective tissue. It holds the outer layer to the body and provides insulation against heat and cold.

The common forms of dermatitis are not allergic, but simple inflammatory reactions of the irritated skin. Dermatitis is the body's way of reacting to the irritant.

Contact dermatitis is different. Contact dermatitis is an allergic reaction to chemicals, physical agents and other substances such as poison oak or ivy. Substances like epoxy resins adhere to the skin and chemically change the proteins located on the skin. Your body's protective system acts to neutralize both the altered protein and the substance which are foreign to your body. The result is dermatitis.

Dermatitis, a reddening and inflammation of the skin, is caused by exposure to many substances, such as solvents.

Your protective system remembers the altered protein and the substance. So, the next time you are exposed to small amounts of the same substance, or a similar substance, your protective system reacts, causing *contact* dermatitis. This is also known as hypersensitivity reaction. Not everyone develops contact dermatitis, just as not everyone develops an allergic reaction to poison oak or ivy.

All occupational dermatitis is preventable. You should keep your skin clean and free of contaminants. Frequent and thorough washing with appropriate cleansers removes irritating substances before they cause trouble. Never wash with solvents! Not only will they cause skin problems but they can be absorbed into your system. Washing facilities should be provided before lunch and at quitting time. Barrier creams and lotions protect your skin. Protective clothing prevents or reduces skin exposure. Make sure your protective clothing is in good condition and changed often. Work clothing is soiled by harmful substances at work. So it is vital that you have two clothes lockers or other containers, one for street clothes and one for work clothes. This protects the members of your household too.

Hazardous substances such as acids, bases, solvents, oils and metal compounds can seriously damage your skin below the surface layer. For example, an acid will burn the skin if the dose and duration of exposure are great enough. All of these substances can penetrate the outer layer of skin and damage the inner layer. Very severe exposure damages tissues under the skin, such as muscles. The effect of these chemical substances is acute and the tissues usually heal after contact has ended.

A less frequent occupational disease is skin cancer. Exposure of long duration to sunlight

or to certain hazardous substances, such as coal tar, asphalt, carbon black, diesel oil and other petroleum products, can cause skin cancers.

Skin cancer caused by petroleum and coal tar products is not the major problem associated with these substances. Petroleum and coal tar products also cause cancer of the lung, kidney or bladder.

Occupational skin cancer is preventable. Follow the same procedures for preventing other skin diseases. Keep your skin clean and free of contaminants.

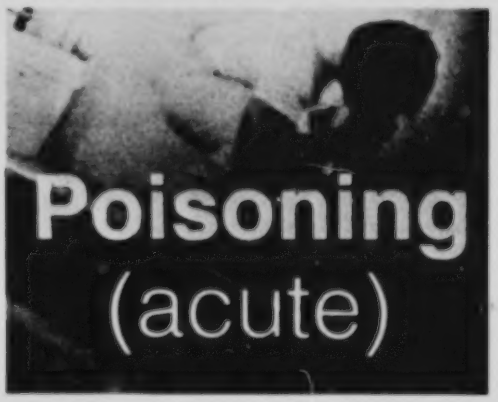
Besides inhalation and skin absorption, toxic substances enter your body through ingestion, or swallowing.

The digestive system is the least common route contaminants take into your body. But it is not uncommon enough to be forgotten. Toxic substances enter your mouth when you eat contaminated food, smoke contaminated cigarettes or wipe your mouth with your contaminated hand or glove. Remember, part of the solid substances that you inhale can be swallowed too.

Thorough washing before eating and smoking is a must. Don't eat or smoke in the work area where airborne contaminants adhere to your food or cigarette or to your fingers.

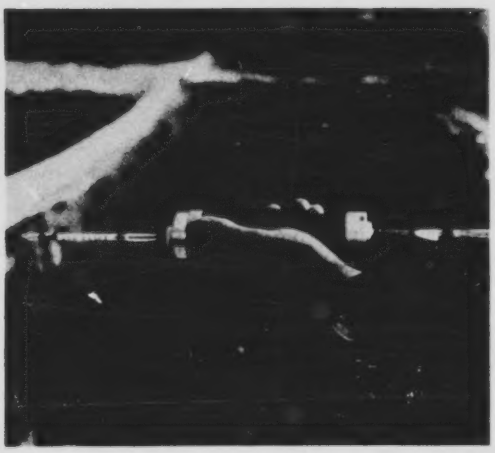
Your digestive tract is selective in what it allows to pass from the stomach and intestines to the bloodstream. As a result, some contaminants may pass right through you without causing much harm. But any contaminant that enters your bloodstream through ingestion can affect other organs just as if it had been inhaled.

Ingestion of a substantial amount of a hazardous substance results in dire consequences. If a co-worker ingests enough to result in poisoning, call a doctor immediately. Try to determine what has been ingested. If your co-worker is unconscious, ask someone else what the substance might be. Look around for containers that give you a clue to what the poison is. After determining what the hazardous substance is, call the doctor again or call a "poison line" and get the antidote. Do not induce vomiting if the worker is groggy, unconscious or if has ingested an acid, base or petroleum product. If the ingested substance is an acid, base or petroleum product, give your co-worker milk if he's conscious. The milk reduces the stomach's ability to absorb these hazardous substances.



When a worker is poisoned, whether through inhalation, skin absorption or ingestion, get professional medical help immediately.

Inhalation, skin absorption and ingestion are the three routes by which hazardous substances enter your body. Exposure through these routes can be controlled by four basic methods. We'll talk about these four basic methods in the "Controlling Health Hazards" unit.



A universal air sampler can tell you the air concentration of specific hazardous substances.

We have tried to give you a few common sense guides to when it may be appropriate to ask for professional and medical help. Suppose you have decided that you do need to ask for help. What kind of help should you ask for? If you go to management or to OSHA, frequently the response will be to make measurements of hazardous materials in the air. What should you do if you are told that all the measurements fall within the regulations? Well, if people are sick or have unusual or abnormal medical conditions, you should not be satisfied with simple air measurements. Instead, you should have a large sample of your coworkers—perhaps all of them—examined. Why? Because ninety percent of all substances known to be harmful do not even have guidelines for permissible exposure limits. And furthermore, there are new substances coming into the workplace everyday that may be harmful and about which we have very little information. Therefore, if people seem to be sick, the fact that a few air measurements are within prescribed regulations may be a false assurance. It may be necessary to examine large numbers of workers, even including retirees. It may even be necessary to go so far as to do a large scale study of the causes of death among those workers who used to be in your trade.

This discussion will help to overcome the feeling among many workers that you are not competent to judge when a health hazard exists. On the contrary, no one could possibly know better than the individual on the spot—the person on the job.

Do not be bashful about asking for help. You cannot assume that the government or anyone else is doing this job for you. If you do assume this, you could be making a fatal mistake.

CONTROLLING HEALTH HAZARDS

Control of occupational health hazards reduces occupational illnesses and deaths. Control means preventing the worker from contacting harmful substances. What you don't inhale, absorb or ingest can't hurt you.

Control of health hazards begins before a factory or plant is built or jobsite is laid out. Safety and health should be engineered in, not added as an afterthought. Engineering in safety and health stops hazards before they get started. Yet, in practice, control of jobsite hazards usually happens after the fact.

Each year more and more untested substances find their way into the products of the paint trades. And each year the rates of cancer and respiratory disease among painters and allied tradesworkers rise. Time after time the "harmless" products of yesterday are found—too late—to contain chemical killers. Today no product used in the paint trades can be considered safe. The only totally safe exposure is ZERO exposure. But avoiding *all* contact with paint trade substances is not possible. Yet you can reduce exposure to hazards enough to keep occupationally related illness out of your life.

There are four basic methods for keeping your exposure as low as possible.

In the left column below are the four control methods. In the right column are practical examples of how and when to use each of these methods. Link the practical examples in the right column with the basic control methods in the left column.

Link the practical examples with the Basic Control Method:

Basic Control Method:

Substitution

Ex: 3

_____ _____ _____

Engineering Controls

_____ _____ _____

_____ _____

Administrative Procedures

_____ _____

Personal Protective Equipment

_____ _____ _____

_____ _____

Practical Examples:

1. **Covered metal containers**
2. **A properly selected respirator**
3. **Using grit instead of silica sand**
4. **Rotating workers from hazardous to non-hazardous areas**
5. **Spray booths**
6. **Long-sleeved shirts or blouses**
7. **Using safer substances like methylene chloride instead of the more harmful substances like trichloroethylene or carbon tetrachloride**
8. **Pre-mixed spackles**
9. **Frequent rest breaks**
10. **Properly selected dust mask**
11. **Wet abrasive blasting attachments**
12. **Trouser legs rolled down and taped to the ankles**
13. **Gloves and barrier creams or salves**
14. **Ventilation systems**

SUBSTITUTION

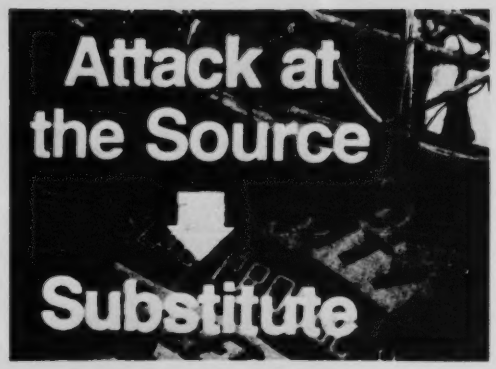
The most effective method for reducing exposure to hazards is substitution or attacking the problem at its source. Substitution removes the hazardous product 'x' from the workplace and replaces it with a *known* safer product 'y'.

Everyone is always searching for the best product to do the job. In the paint and allied trades, this has usually meant paint products that last long, dry fast, look good, coat quickly or clean easily. Today the best product must also be selected for its safety.

When selecting substitute products or when choosing new products for a job, make sure you know what substances the products contain. Substituting unknown substances may be disastrous. If chemical contents are not listed on the product's label, or if only trade names appear, ask your employer what the product contains. If your employer doesn't know, or if you feel you cannot ask your employer, write directly to the manufacturer or to the Brotherhood of Painters and Allied Trades.

Remember: Just because a label lists no harmful substance, this does not mean the product contains no harmful substances.

Number 3, using grit or shot instead of silica sand for sandblasting, is a good example of substitution. Silica is *known* to be harmful when inhaled. Silica breaks up into dust. Once in the lungs, it stays forever, irritating them and causing fibrosis. Grit and shot do not break up as finely as silica, so less is inhaled. Also, grit and shot are more easily dealt with by the body's defenses in the lungs. Consequently, grit and shot are safer than silica.



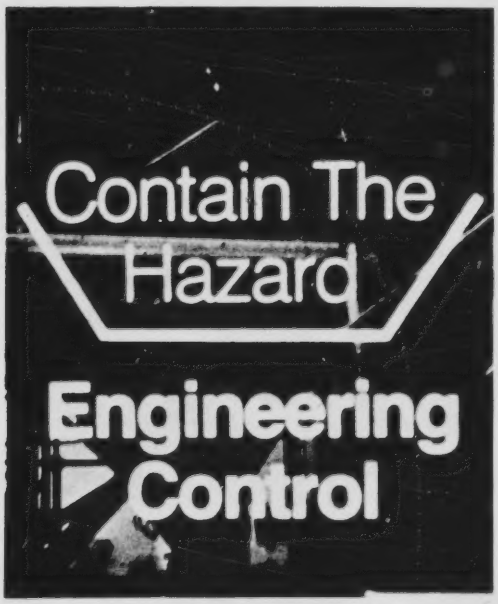
Substituting slag, grit and shot for sand in abrasive blasting will greatly reduce the blaster's exposure to dangerous free silica.

Unfortunately, one of the problems with substitution is that products safer for you are sometimes not suitable to the work. Some blasting jobs cannot be done as well with grit or shot, so other control methods are required to protect you from exposure to silica.

Another example of substitution is Number 7, using the safer product, methylene chloride, instead of the more harmful products, trichloroethylene or carbon tetrachloride. This example demonstrates another problem with substitution. Sometimes the substance you substitute also causes harmful effects. In the case of substituting toluene for benzene, the toluene still contains some benzene as a contaminant.

Often you cannot attack at the source, substitute, because a safer substitute does not exist. You then face the choice of working with the product or not working at all. The obvious choice is to work. But this does not mean you must work unprotected.

Half the battle of protection is already won when you are aware of the hazardous substances in the products you use. Once known, they can be controlled. The best advice is to treat all substances as hazardous.



Engineering controls, such as ventilation systems, contain hazards and help prevent damage to your body.

ENGINEERING CONTROLS

After substitution, engineering control is the second best method for reducing dose and duration of exposure. Engineering controls help keep substances out of the breathing zone, off the skin and out of the mouth.

Ventilation systems, enclosures and barricades that intercept or contain hazardous substances are all engineering controls.

Number 1, covered containers, is an engineering control which isolates the hazard (solvent vapors) from you. Keeping the lid on the container when not in use confines the harmful vapors to the container.

A ventilated solvent storage cabinet is another engineering control. The ventilated cabinet keeps the concentration of solvent vapors below harmful levels and below the lower explosive limit.

Engineering controls also isolate processes. The best example of process isolation is a petroleum processing plant where the workers watch dials and gauges to assure that machines do what they are supposed to do. Needless to say, process isolation only works where the job can be highly automated. Process isolation is very expensive both for management and for labor.

Abrasive blasting rooms and Number 5 on your list, paint spray booths, are also examples of process isolation. Abrasive blasting rooms and paint spray booths reduce hazardous exposure for all workers except the worker doing the abrasive blasting or spray painting. For this worker other protective measures must be implemented, such as ventilation and personal protective equipment.

Ventilation

Perhaps the most widely used and important form of engineering control in the paint and allied trades is Number 14, ventilation.

There are two types of ventilation systems: general and local.

General Ventilation

General ventilation spreads fresh air through the workplace. A primitive form of general ventilation is opening windows while painting in a residential structure so that fresh air replaces the contaminated air. Several problems occur with such a primitive system, including no breeze and very cold or hot air.

A more sophisticated general ventilating system consists of air inlets, blowers, ducts, air outlets and air treating equipment. For every cubic foot of air removed from the building, a clean cubic foot of air (make-up air) must enter the building.

General ventilation is only effective against widespread, low concentrations of hazardous substances. It cannot be used to control high concentrations of hazardous substances that occur in isolated areas.

These four principles must be followed when installing a general ventilation system:

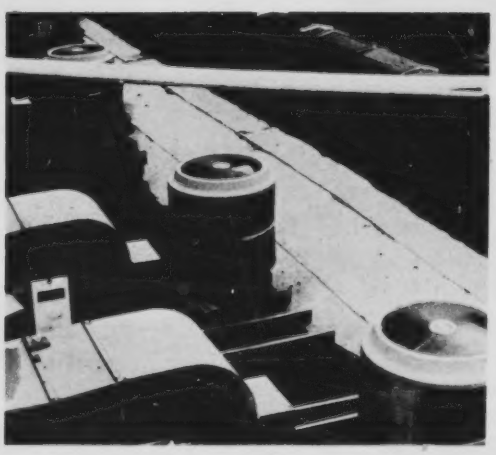
One, the make-up air goes first to uncontaminated areas and last to areas where hazardous substances are present. This prevents air from spreading contaminants to uncontaminated work stations.

Two, the system evenly distributes the air flow. You do not want drafts in some places and dead air in others.

Three, the make-up air is clean and fresh. Air currents and pollution sources are considered in ventilation design. Air inlets are located away from any exhaust outlets or other pollution sources, such as smoke stacks. Exhaust outlets push the spent air away from all air inlets, doors and windows. Exhausted air is never re-circulated as make-up air. If this occurs—and it sometimes does—workers not normally exposed to contaminants are exposed.

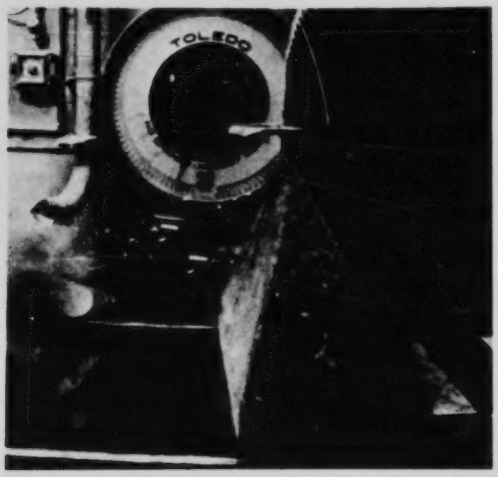
Four, air entering the workplace is cooled or heated, humidified or dehumidified as necessary. If this sounds as if a plant or factory should feel like an air-conditioned office—well, that's the ultimate principle behind general ventilation.

Inlets for ventilation systems, compressors and other fresh air systems must be located away from contamination sources, such as factory exhaust outlets.



Local Ventilation

A local ventilation system is like a fancy vacuum cleaner. Local ventilation systems eliminate or reduce "point" sources of air contaminants.



The hood of a local ventilation system must be located near the source of contamination.

A local ventilation system has four basic parts: hoods, ducts, filter and fan. A qualified professional designs the system to remove air contaminants from contact with workers.

The hood captures contaminants where they are released, using natural drafts when possible. The work process is enclosed as much as possible, and the air flow is never routed through the breathing zone of the workers.

Ducts draw contaminants from the hood to the filter. Two principles govern duct design. First, the ducts are round with as few bends as possible. Any bends are gradual. Bends reduce the air flow in the ducts and cause the contaminants to settle out. Second, the air flows through the ducts fast enough to keep the particles from settling out. One sign of a poorly designed duct is the presence of settled particles inside the duct.

Air filters prevent neighborhoods from being polluted by industrial waste. There are many types of filters, but all of them, at some point, need to be cleaned or replaced. Clogged filters reduce air flow and expose you and your co-workers to the contaminants.

The fourth part of a local ventilation system is the fan. The size and type of fan depend on the air flow needed, the contaminant exhausted and the number and size of the ducts. The fan provides negative pressure—or suction—which draws the contaminant to the hood, through the ducts and to the filter. Like all machines, the fan needs periodic maintenance as recommended by the manufacturer. Fans must also be explosion-proof.

Three main principles determine the design of local ventilation systems. First, the hazard is enclosed as much as possible. Placing the hood as close as possible to the point of contamination and adding flanges help.

Second, air flow at all openings moves into the hood. Avoid cross drafts that can blow contaminants away from the hood and into the breathing zone of the worker.

Third, the velocity of the air into the hood is great enough to carry the contaminants away from the worker's

breathing zone and into the hood. Different size contaminants need different air velocities. For example, very fine, light dusts require a velocity of 2,000 feet per minute, while heavy or moist dusts require a velocity of 4,500-plus feet per minute. A spray painting operation requires a velocity of 2,000 feet per minute.

Three main problems crop up in local exhaust systems. The worst problem is poor design. Many systems are laid out by people with little knowledge of industrial ventilation systems. To correct this problem, an entirely new system may have to be installed.

A second major problem is inadequate suction. This occurs because of an inadequate fan or because of ducts and hoods added on from time to time without increasing the capacity of the fan.

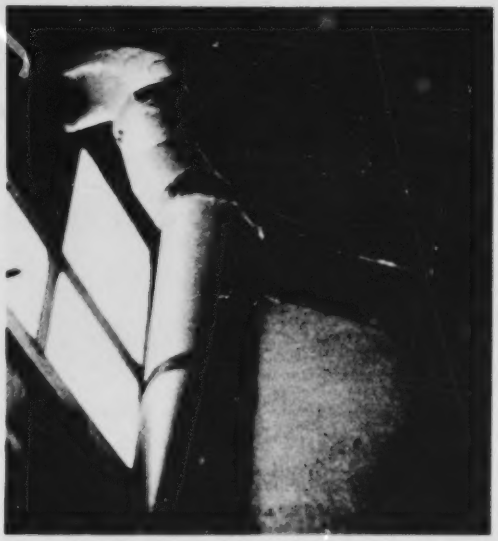
The third problem with a local exhaust ventilation system is an inadequate supply of make-up air. The make-up air should equal exhausted air. This is accomplished by blowers and vents. If there is inadequate make-up air, a negative pressure can be felt when you try to open a door to the outside and feel as though you are pushing it against something. Negative pressure reduces the effectiveness of the ventilating system.

Maintaining Ventilation Systems

Sophisticated tests are done to check the operation of the ventilation system. In order to have these tests performed, your employer brings in a qualified expert. However, there are several things you can do to detect obvious defects.

Visually inspect the ventilation system periodically. Look for damages, corrosion, leakage, loose fittings or blockage. Bring defects to the attention of your employer immediately.

If you are working at a ventilated process and you notice an odor or see particulates or smoke, the ventilating equipment is not working properly. Notify your employer.



The ducts of a ventilation system must not have cracks, rust, corrosion, loose fitting or blockage. Also, all bends in the ducts must be gradual.

If the ventilation equipment at your work station is not working properly, it is probably not working at other work stations. Your efforts to improve working conditions will benefit your co-workers as well as yourself. You have the responsibility to report any defects.

Wet Methods

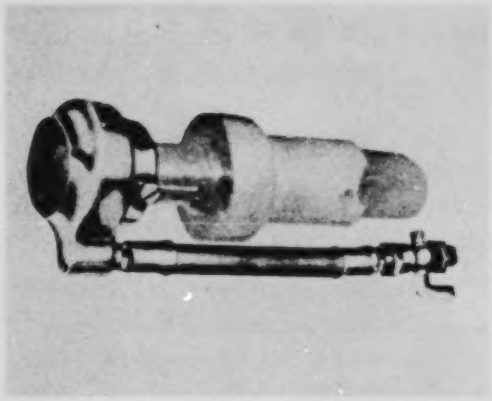
Wet method is another engineering control. Exposure to particulates, such as asbestos and silica, is controlled by wetting. Just as dirt is wetted to keep dust down, so can asbestos and silica be wetted. Wet abrasive blasting attachments, Number 11, keep silica dust levels down and reduce your exposure. Pre-mixed spackles, Number 8, eliminate the mixing process. Mixing asbestos-containing spackles releases harmful amounts of asbestos into your breathing zone. Premixed spackles rule out this potential exposure.

The problems with most engineering controls are cost and maintenance. The cost of some engineering controls—especially on temporary construction sites—makes them impractical.

If engineering controls are installed, maintenance becomes the big problem. A clogged spray gun is cleaned right away because work can't go on without it. But a clogged ventilation filter is often neglected because it doesn't immediately affect getting the job done—even though the cost eventually shows up in deaths, injuries and medical bills and in the cost of the product.

ADMINISTRATIVE PROCEDURES

When substitution and engineering controls—either separately or together—cannot reduce exposure to hazardous substances to safe levels, then administrative procedures are used to control hazards.



Wet abrasive blasting attachments reduce the blaster's exposure to free silica.

Administrative procedures arrange work schedules to reduce each worker's daily duration of exposure to hazardous substances.

Job rotation, Number 4, is a common form of controlling hazards through administrative procedures. Rotating workers from high exposure jobs to jobs with little or no exposure works well in plants and factories. For example, in plants where the noise levels exceed the permissible exposure limit set by OSHA, a worker works a few hours in a high noise area and then rotates to a quieter work area. If properly implemented, job rotation keeps the daily duration of exposure to a hazard below the permissible exposure limit.

Rest periods, Number 9, are another kind of administrative procedure. Rest periods, like job rotation, keep the daily duration of exposure below permissible exposure limits. In

addition to reducing daily duration of exposure, rest periods give you a chance to relax and catch your breath. After returning to work, you are refreshed and more productive, more alert, more aware of your workplace and better able to avoid hazards.

Work staggering is a third way to control hazards through administrative procedures. Work staggering reduces the dose or concentration of a hazard. While the hazards of an individual operation may not be serious, the cumulative effects of hazards from many different simultaneous work operations can be very serious. Staggering the operations over time reduces the cumulative effects of hazards.

For example, OSHA's permissible exposure limit for asbestos is 2.0 fibers per cubic centimeter of air. A floorcoverer sanding asbestos-backed tile releases 1.5 fibers of asbestos per cubic centimeter of air. If a taper is sanding asbestos-containing spackle in the same room, another 1.5 fibers of asbestos per cubic feet of air can also be released. Performing both jobs at the same time releases 3.0 fibers of asbestos per cubic feet into the air, well above the permissible limit.

Job rotation, rest breaks and lunch periods are administrative controls that can effectively reduce the worker's daily exposure to harmful substances.

When work is staggered, the floorcoverer does not sand until the taper finishes. Clearly, work staggering requires preplanning and good organization by job supervisors and management personnel, but it effectively controls hazards, especially on temporary jobsites.

Administrative procedures, such as job rotation, rest periods and work staggering, control hazards through well-planned work schedules.

PERSONAL PROTECTIVE EQUIPMENT

When substitution, engineering controls and administrative procedures—either separately or in combination—do not reduce your exposure to health hazards to safe levels, then use personal protective equipment. It's your last resort.

Examples of personal protective equipment are Numbers 2 and 10, a properly selected respirator and a properly selected dust mask. Respirators prevent inhalation of hazardous substances. Personal protective equipment for your skin includes Number 6, long-sleeve shirts or blouses; Number 12, trouser legs rolled down and taped to ankles; and Number 13, gloves and barrier creams or salves.

Read the next chapter for selection and maintenance of your personal protective equipment.

Personal protective equipment, the last resort for controlling hazards, should be used when substitution, engineering and administrative controls are not technically feasible.

Substitution, engineering controls, administrative procedures and personal protective equipment are your weapons against workplace hazards. Of these four hazard controls, personal protective equipment is the most important for painters and allied tradesworkers.

An air-fed abrasive blasting hood must be worn by all abrasive blasters.

Single use dust masks are appropriate for low level silica exposure, but not for abrasive blasting.

YOUR LIFESAVER: PERSONAL PROTECTIVE EQUIPMENT

52

Personal protective equipment is the most important hazard control for most painters and allied tradesworkers even though it should be used only as a last resort. Why should painters and allied tradesworkers use personal protective equipment? Below are several possible reasons. Which do you think are right? You can choose more than one answer.

Personal protective equipment:

___ **1. is the most ideal means of controlling workplace hazards.**

___ **2. must be used because installing engineering controls on temporary jobsites is usually impracticable.**

___ **3. should be used when the equipment is cheap, easy to use and made by a reputable manufacturer.**

___ **4. is preferred by painters and allied tradesworkers over other forms of hazard controls.**

___ **5. must be used until other hazard controls are installed.**

___ **6. must be used while safer substitutes or engineering controls are being developed.**

___ **7. should be used when the equipment provides protection from an existing hazard.**

___ **8. is the only effective control against the hazards encountered by painters and allied tradesworkers.**

___ **9. should be used when the equipment meets minimum comfort and quality requirements.**

___**10. must be used when a hazard exists even though other control measures have been installed.**

___**11. should be used when the equipment permits you to perform the job with the desired quality and in minimum time.**

Use personal protective equipment whenever it protects you from an existing hazard.

If other hazard controls—substitution, engineering controls and administrative procedures—are not feasible, then use personal protective equipment. If other hazard controls are feasible, use personal protective equipment in the interim while these other hazard controls are being implemented. And even when other controls are implemented but a hazard still exists, use your personal protective equipment.

Personal protective equipment is *not* the most ideal means of controlling hazards. And it is probably not the one that most of you like best. But in many cases it's your only alternative.

The personal protective equipment you use must be tested and approved by NIOSH, the National Institute for Occupational Safety and Health, or by MSHA, the Mine Safety and Health Administration.

How do you know whether your personal protective equipment is approved by NIOSH or MSHA? In the back of this manual is a list of the NIOSH- and MSHA-approved respiratory equipment. NIOSH only lists approved *respiratory* equipment. For other equipment you must check the label. A word of caution: don't completely rely on ads or labels. A 1976 NIOSH test of more than 200 safety shoes labeled and advertised as NIOSH-approved showed over 40 percent failed to meet at least one of NIOSH's minimum requirements. So even if the manufacturer claims the equipment is NIOSH- or MSHA-approved, check it out. Make sure it is approved. Of course, even approved equipment must be maintained to keep it effective.

Protective headgear must pass tests established by the American National Standards Institute (ANSI). This hard hat cracked and failed.

Most personal protective equipment such as safety glasses and goggles and respirators must be provided and paid for by your employer. However, your employer can require you to provide other personal protective equipment, such as safety shoes. Who supplies this equipment is resolved in collective bargaining. Ideally, an agreement should be negotiated under which your employer provides *all* personal protective equipment. Regardless of who provides what, your employer is responsible for maintaining equipment in good operating condition. But you must report any and all defects to your employer.

Unavailability and discomfort are the most common reasons workers do not wear personal protective equipment. Your employer is responsible for providing the personal protective equipment and insuring that it is used. The manufacturer is responsible for designing comfortable personal protective equipment. Even if your equipment is not comfortable, use it anyway because the consequences of not using personal protective equipment do not compare with the discomforts of using it.

Below are three sets of workplace situations. The first set is for General Painters (including Abrasive Blasters and Drywall Tapers); the second set is for Paint Makers; and the third set is for Floorcoverers. Each situation requires some form of personal protective equipment. Read the set of workplace situations for your trade and check the answers that apply to you.

Set I
GENERAL PAINTERS

SITUATION I

You are working 30 feet above the ground on a two-point suspension scaffold, abrasive blasting a tank with sand.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ leather gauntlet gloves
___ ear plugs
___ leather apron
___ neoprene gloves
___ air-fed helmet
___ dust mask
___ safety shoes
___ safety belt and life line

___ I have not worked in a situation like this

SITUATION II

You are spray painting a bridge with red lead paint from a needle beam scaffold. Safety belts and lifelines cannot be used because of the location of the scaffold.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ air-purifying respirator with organic vapor cartridge and paint spray filter
___ leather gauntlet gloves
___ safety net
___ dust mask
___ ear plugs
___ paint spray hood

___ I have not worked in a situation like this

SITUATION III

You are working next to a taper who is mixing and sanding spackle. You notice on the label of his bag the words, "contains asbestos" and there is dust in the air.

___ **I have worked in a situation like this**

___ **I did use personal protective equipment**
Check the personal protective equipment used:

- ___ **air-purifying respirator with organic vapor cartridge**
- ___ **neoprene gloves**
- ___ **dust mask**
- ___ **safety shoes**
- ___ **hard hat**
- ___ **airline respirator**

___ **I have not worked in a situation like this**

SITUATION IV

You are spraying the interior of a tank with a paint that contains solvent. Your eyes are watering. Above you on a scaffold are people repairing the tank.

___ **I have worked in a situation like this**

___ **I did use personal protective equipment**
Check the personal protective equipment used

- ___ **dust mask respirator**
- ___ **hard hat**
- ___ **airline respirator**
- ___ **paint spray hood**
- ___ **gauntlet gloves**
- ___ **eye goggles**

___ **I have not worked in a situation like this**

Set II
PAINT MAKERS

SITUATION I

You are working below a platform where co-workers are stacking materials.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ leather gloves
___ safety belt and lifeline
___ safety shoes
___ hard hat
___ eye goggles
___ respirator

___ I have not worked in a situation like this

SITUATION II

You are cleaning the inside of a tank with an organic solvent.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ leather apron
___ hard hat
___ full facepiece airline respirator
___ safety belt and lifeline
___ non-sparking safety shoes
___ protective gloves

___ I have not worked in a situation like this

SITUATION III

You are emptying lead powder into a mixer.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ hard hat
___ safety belt and lifeline
___ particulate removing respirator
___ eye goggles
___ leather apron
___ safety shoes

___ I have not worked in a situation like this

SITUATION IV

You are unloading 55-gallon drums from a truck.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ hard hat
___ protective gloves
___ dust mask
___ eye goggles
___ safety shoes
___ leather apron

___ I have not worked in a situation like this

Set III
FLOORCOVERERS

SITUATION I

New tile is to be installed in a renovated house. To remove the old asbestos-backed tile, it is sanded down to the original flooring.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ knee pads ___ ear muffs or plugs ___ hard hat
___ respirator ___ safety shoes ___ protective gloves

___ I have not worked in a situation like this

SITUATION II

Carpeting is installed in a closet of a new home.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ respirator ___ safety shoes ___ knee pads
___ hard hat ___ ear muffs or plugs ___ protective gloves

___ I have not worked in a situation like this

SITUATION III

You are installing tile in a new house. In the room next to you, the walls are being spray painted. You can smell the vapors from the spray painting and your eyes are watering.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ respirator ___ eye goggles ___ hard hat
___ protective clothing ___ safety shoes ___ ear muffs or plugs

___ I have not worked in a situation like this

SITUATION IV

You must tile the kitchen floor in a new house. In order to bring the boxes of tile into the kitchen, you pass under a scaffold erected by a roofer.

___ I have worked in a situation like this

___ I did use personal protective equipment
Check the personal protective equipment used:

___ respirator ___ safety shoes ___ ear muffs or plugs
___ hard hat ___ protective gloves ___ eye goggles

___ I have not worked in a situation like this

General Painters' Headgear

In Situation I, abrasive blasting a tank, you need an abrasive blasting helmet to protect against ricocheting abrasives. In Situation IV, painting the interior of a tank below workers, a hard hat protects against any tools, materials or equipment that fall off the scaffold. Clearly, in this situation there is the possibility of a falling object hitting your head—so you should protect it. You should also be wearing safety shoes.

Paint Makers' Headgear

In Situation I, working below a platform, you need a hard hat to protect your head from tools and parts that might fall. A hard hat is needed in Situation IV, unloading 55-gallon drums from a truck.

Protective headgear, besides meeting ANSI standards, must fit well.

Floorcoverers' Headgear

A hard hat is worn in Situation IV, where you pass under a roofer's scaffold to bring boxes of tile into a house. Clearly, in this situation there is the possibility of a falling object hitting your head and so you should protect it. You should also be wearing safety shoes.

Head Injuries

One hundred and thirty thousand head injuries in one year! That's a lot! Head injuries, one of the highest compensated injuries to workers, often include brain damage.

You need protective head gear when working beneath people, tools and equipment or when working around flying objects. The specific protective head gear you need depends on the hazards you are exposed to. An abrasive blaster needs an abrasive blasting helmet. A painter below a scaffold needs a hard hat.

Work nearby may also affect you. Maybe the job you are doing doesn't require protective head gear. But co-workers around you may pose a hazard to your head which requires you wear a protective hat. For instance, iron workers may be overhead when you're painting steel below them.

Protective head gear may sometimes get in your way, but it also gets in the way of a falling hammer.

General Painters' Eye Protection

In Situation IV, spray painting the interior of a tank, when your eyes are watering from the solvents, you need eye protection. You also need a respirator. The respirator should have a full facemask to protect your eyes.

Protective goggles should fit snugly, be comfortable, durable and be kept clean and disinfected.

Paint Makers' Eye Protection

In Situation II, cleaning the inside of a tank with an organic solvent, eye protection is needed because of the organic solvents. Eye protection is provided by eye goggles or preferably by a full facepiece respirator. The same is true for Situation III, emptying lead powder into a mixer.

Floorcoverers' Eye Protection

In Situation III, where your eyes are watering from spray painting performed in the room next to you, you need protective eye goggles. Many solvents in paints cause eye irritation and damage. This situation proves the point that you must be aware of the work going on around you. You should also wear a respirator in this situation. If you can smell solvent vapors, you know you are inhaling them.

Eye Injuries

One hundred and thirty thousand eyes injured in one year! Most of these eyes would still be untouched if their owners had used safety glasses or goggles. Flying objects and hazardous substances such as solvents, acids and bases can permanently damage your eyes. The specific hazard you are exposed to will determine your eye protection needs.

In the back of your manual is a list of eye hazards. Opposite each eye hazard you will find the appropriate eye protective device.

If you wear corrective lenses at work, make sure the lenses are made of safety glass. If not, then wear protective goggles over your regular glasses.

General Painters' Hand Protection

Gauntlet gloves are needed for abrasive blasters in Situation I. Polyvinyl alcohol gloves are needed when handling chlorinated hydrocarbon solvents, such as methylene chloride. Remember, some hazardous substances can penetrate right through your skin and enter your bloodstream.

Paint Makers' Hand Protection

Protective gloves are needed in Situation II, cleaning the inside of a tank with an organic solvent. The protective gloves must be impervious to the organic solvent used. In Situation III, emptying lead powder into a mixer, protective gloves are used, and you should wash your hands and arms thoroughly before eating or smoking. Also, gloves are worn in Situation IV, unloading 55-gallon drums, to protect against cuts and scrapes.

Hand Injuries

Six hundred and eight thousand injuries to fingers, hands and arms in one year! How many happened because protective handwear was not used? No one knows, but you can bet that such injuries don't happen to people who use appropriate protective handwear. Hand and power operated tools, hazardous substances and flying particles all cause injuries to the fingers, hands and arms.

General Painters' Footwear

Protective footwear is worn in Situation I, abrasive blasting a tank, and in Situation IV, spray painting the interior of a tank below other workers. Also, in Situation IV, non-sparking safety-toe shoes are worn because the solvent vapor can build up and explode if a spark should be present.

Paint Makers' Footwear

Safety shoes are worn in Situations I and IV where dropped or falling objects can smash feet. In addition, non-sparking safety shoes are worn when cleaning the inside of a tank with an organic solvent, as in Situation II. A spark in a confined area where volatile solvents are present can trigger an explosion.

Floorcoverers' Footwear

Although it's impractical for floorcoverers to wear heavy safety shoes, you really do need protective footwear in Situation IV, where you must carry boxes of tile under the scaffold erected by a roofer; or in any situation where you can drop heavy objects on your feet or step on sharp objects. Lightweight footwear, such as safety-toe street shoes, is what is needed for floorcoverers. At present, no manufacturer makes a safety shoe especially designed for the needs of the floorcoverer. IBPAT is working on this problem.

Foot Injuries

Two hundred thousand injuries happen to defenseless feet and toes each year! Falling objects have crushed many toes. Protective footwear saves them. Safety-toe shoes provide protection from falling objects. The inner sole of your safety-toe shoes should protect from penetration by water, oil, solvents, heat, sharp objects and metal. Where there is danger of flying particles, such as

62

from abrasive blasting, shin guards are needed in addition to safety shoes. Boots and rubbers protect against heat, cold and slippery srufaces. Slippery surfaces cause falls that damage other parts of the body. The boots and rubbers you wear should also protect against penetration by sharp objects.

Non-sparking shoes should be used when there is possibility of explosion from concentrations of flammable or combustible substances, such as hydrocarbon solvents. Cleaning and painting tanks that have contained gasoline or volatile solvents is one situation where non-sparking shoes must be worn. Make sure your safety shoes and other protective equipment are NIOSH/MSHA approved.

Foot care is also a major part of foot protection. Thirty-eight percent of foot problems are skin disorders. Skin disorders of the feet are often caused by perspiration because thick safety shoes prevent evaporation and allow absorption of harmful substances which come into contact with the skin. To remedy this problem, don't avoid safety shoes! Do wash your feet and change into clean clothes, socks and shoes after work in the washrooms, showers and locker facilities provided by your employer. When these facilities are not provided, such as on temporary construction sites, wash your feet with soap and water when you get home and clean your shoes and socks.

General Painters' Ear Protection

In Situation I, abrasive blasting a tank, you need ear plugs. The noise generated from blasting and the air rushing into your helmet create a hazard for your ears.

Floorcoverers' Ear Protection

In Situation I, where you are sanding asbestos-backed tile, you need properly fitted ear muffs or plugs. The loud noise generated by the sander causes temporary hearing loss. In addition, you need a respirator to protect you from asbestos dust in the air.

Ear muffs provide excellent protection against loud noises, but only if they are properly fitted.

Noise

Have you ever used a power tool such as an edger? Or sander? Have you ever used a pneumatic tool or worked near a compressor? How was your hearing afterward? You may

have experienced a temporary hearing loss. Constant and repeated exposure to loud noise extends temporary hearing loss into permanent hearing loss.

Ear muffs, like those worn by airport ground crews, are very effective against loud noises, especially when the muffs are properly fitted. Ear plugs reduce noise levels too, but they aren't as effective as ear muffs. Forget about the cotton; whether natural or synthetic, it doesn't work.

General Painters' Additional Protection

Protective headgear, safety glasses and goggles, protective gloves, safety shoes, ear muffs and ear plugs are some of the personal protective equipment you need as a general painter.

The safety belt and lifeline will protect this abrasive blaster if the scaffold breaks up or the blaster slips.

The abrasive blaster in Situation I also needs a safety belt, lifeline and leather apron. Any time you are on a two-point suspension scaffold, a safety belt and lifeline are required. The lifeline must be securely tied off—*not* tied to the scaffold. In Situation II, a safety net is required, since lifelines and safety belts are not possible. In Situations II and IV, the painters need a paint spray hood to keep the overspray off them.

Paint Makers' Additional Protection

The worker cleaning the inside of a tank with an organic solvent, as in Situation II, needs a safety belt and lifeline with co-workers standing by. In this case, the worker could be overcome by the organic vapors if the respirator failed. The standby workers are needed for rescue if an accident does happen. In addition, the standby workers need rescue equipment including appropriate respirators.

Floorcoverers' Additional Protection

You need other types of personal protective equipment depending on your work situation. You need knee pads in Situation II, where a kicker is used in a small closet. Knee pads relieve the pressure on the knees from kneeling. Remember, use a kicker only when a stretcher won't work.

Respirators

Respirators are very important personal protective devices. They protect your lungs and airways from airborne substances.

What is a respirator? It's a device fitting over your nose and mouth and sometimes your eyes that maintains a supply of breathable air for you.

Two conditions require respirators: (1) lack of oxygen, or (2) the presence of hazardous substances in the air. Painters and allied tradesworkers usually wear respirators because of the presence of hazardous substances in the air, although situations do arise when painters and allied tradesworkers need respirators because of a lack of oxygen. The specific hazard determines the type of respirator.

Air-purifying and supplied-air are two types of respirators often used by painters and allied tradesworkers.

Air-Purifying Respirators

Air-purifying respirators are the most commonly used respirators in construction and industry today. The air-purifying respirator screens out harmful substances with a filtering element such as a filter, cartridge or canister. Filtering elements have a limited life. Follow the manufacturer's recommendations and periodically replace the filter element.

An air-purifying respirator screens out harmful substances.

Air-purifying respirators have several limitations. They absolutely cannot be used in an area without adequate oxygen. The air-purifying respirator only screens out contaminants. It does not add oxygen. If you are working in a tank or other confined area, make sure your employer monitors the oxygen content of the air.

Leakage is another problem with air-purifying respirators. As you inhale, a negative pressure is created in the face mask, drawing air through the filter element. If the respirator has not formed a tight seal with your face, unfiltered air will also be drawn in around the edges.

This problem is overcome by properly fitting the respirator and performing a leak check. If a tight fit is not possible, then you need a respirator custom-fitted to your face. Also, an air-purifying respirator can be equipped with a blower which creates a positive pressure and reduces the possibility of inward leakage.

The respirator should form a tight seal with your face.

Air-purifying respirators also make breathing more difficult. Filters, cartridges and canisters restrict air flow to your lungs. As breathing resistance increases, additional strain is placed on the heart, a condition to avoid if you have chronic emphysema, bronchitis, fibrosis or heart problems. Air purifying respirators with blowers can help eliminate this problem. But before wearing a respirator, you should first undergo a medical exam to determine if you are physically fit to wear a respirator.

"Particulate" removing and "Gas and Vapor" removing are two kinds of air-purifying respirators.

Particulate-removing respirators screen out dusts, metal fumes and mists with a filter. The filter must be replaced whenever breathing becomes labored — a sign that the filter is used up. The filter only screens out particles larger than 1/83.333 of an inch. Smaller particles can get through to you.

These particulate-removing respirators cannot be used for paint, lacquer and enamel mists or organic vapors from solvents.

A single use dust mask is a very popular particulate-removing air-purifying respirator. The single use dust mask is very inexpensive and provides protection for low level exposure to harmful dusts, such as silica or asbestos. However, the single use dust mask cannot be used for exposure to solvent vapors and paint spray mists, although often it improperly is.

General Painters

You need a particulate-removing air-purifying respirator in Situation III, working near a taper using asbestos-containing spackle. You can bet you'll be inhaling the asbestos fibers if you don't use a dust mask respirator.

Paint Makers

In Situation III, emptying lead powder into a mixer, a particulate-removing air-purifying respirator must be worn. The lead dust generated by pouring lead powder into the mixer can be inhaled, causing severe illness.

Floorcoverers

You need a particulate-removing air-purifying respirator in Situation I where you are sanding asbestos-backed tile. Asbestos is a dust or particulate. For low-level exposure to asbestos dust a particulate removing air-purifying respirator will do, but for high exposure you need a supplied-air respirator.

Exposure to gases and vapors requires a gas and vapor removing air-purifying respirator. A cartridge or canister is used in place of a filter. Cartridges and canisters are designed for specific gases and vapors. Use the correct cartridge or canister for the gas or vapor you are exposed to. Cartridges and canisters must be color coded and labeled. A black cartridge or canister, for example, is designed for protection against organic vapors. In the back of your manual is a list of hazardous substances with the appropriate cartridges or canisters. Cartridges and canisters have a limited shelf life; they can only be stored for a limited period of time.

Air-purifying respirators should only be used if the gas or vapor has warning properties below the permissible exposure limit set by OSHA. Warning properties mean that you can taste or smell the hazardous substance. If the gas or vapor has no warning properties, then do not use an air-purifying respirator. If you are using a gas or vapor removing air-purifying respirator and you smell or taste the hazardous substance, leave the hazardous area and replace the cartridge or canister.

Some cartridges or canisters are approved for exposure to particulates, but they must say so.

A black cartridge is designed for protection against organic vapors.

General Painters

In Situation II, you need an air-purifying respirator with an organic vapor cartridge and a paint spray filter. The organic vapor cartridge protects you from exposure to solvent vapors and the paint spray filter protects you from the overspray and pigments, such as lead. In Situation IV, painting the interior of a tank, you may need an airline respirator if the concentration of solvents and paint spray builds up too high.

Floorcoverers

Back in Situation III, a respirator is needed. In this case, probably an air-purifying respirator with an organic vapor cartridge would do the job. You know it's safe to use an air-purifying respirator because you can *smell* the hazardous vapors. But to be absolutely sure, your employer should take an air sample and follow the respirator selection procedure in the back of your manual.

Supplied-Air Respirators

Supplied-air respirators deliver breathable air to you from a source free of hazardous substances. Extreme care must be taken to insure the source of air is free of hazardous substances. The connections on the airline or hose must be air tight and fit snugly together. In addition, the airline or hose must be protected from objects which cut or puncture it, allowing hazardous substances to enter the air supply.

The connections on the airline or hose of a supplied air respirator must be air tight and fit snugly together.

Supplied-air respirators have three advantages that promote their use. First, a positive pressure can be applied to the face mask, greatly reducing the inward leakage of hazardous substances. Second, supplied-air respirators are lightweight and can be used for long periods of time. Finally, since air is supplied to you, breathing resistance is minimal. This enables workers with bronchitis, emphysema, fibrosis and heart problems to use supplied-air respirators.

Supplied-air respirators have three disadvantages. First, they restrict movement between widely separated work stations. Second, if the airline or hose is damaged, you are exposed immediately to the full effects of the hazardous substance. And third, the supplied-air respirator has more parts and requires more maintenance than air-purifying respirators. More parts means greater chance of failure.

Hose-mask and airline are two kinds of supplied-air respirators.

Hose-mask respirators consist of a large diameter hose that supplies air to you. The hose may be attached to a hand or motor operated blower. If the hose is attached to a blower, the hose may be up to 300 feet long. If the hose is not attached to a blower, the hose can only be 75 feet long. The use of a blower is preferred because it creates a positive pressure in the facemask. Without a blower, you must draw the air

through the hose with your lungs.

Airline respirators deliver air from a compressor, or similar device, at very high pressure to the regulator which you wear. The regulator reduces the air pressure to the facemask.

The airline must be securely attached to prevent accidental disconnection. Also, the connector on the airline must not fit outlets for other gas systems, including oxygen. The compressor or similar device must be situated to avoid entry of contaminated air into the system. The compressor or similar device must have an air reservoir to enable you to escape from a hazardous environment in the event the air source, compressor or similar device fails. If a compressor is used, alarms must be installed to indicate compressor failure and overheating. In addition, if an oil-lubricated compressor is used, the compressor must be equipped with a high-temperature alarm or carbon monoxide alarm.

General Painters

In Situation I, abrasive blasting the tank, you need a continuous flow airline respirator connected to an abrasive blasting helmet. Also, in Situation IV, painting the interior of a tank, you should have an airline respirator for maximum protection.

Paint Makers

In Situation II, cleaning the inside of a tank with an organic solvent, a full facepiece airline respirator is worn. Solvent vapors build up fast in confined places, such as tanks, so the added protection of an airline respirator is needed.

The full facemask, hood or helmet is at least twice as efficient as the half facemask.

Facepieces

Most respirators have several styles of facepieces. The quarter-mask covers your mouth and nose but does not extend below your chin. The half-mask also covers your nose and mouth but seals below your chin.

Generally, a properly fitted half-mask is twice as efficient as a properly fitted quarter-mask.

The full facemask not only covers your nose, mouth and chin, but also covers the eyes. If a hazardous substance causes eye irritation, a full facemask, hood or helmet must be used. The full facemask, hood or helmet is at least twice as efficient as the half facemask. However, the full facemask, hood or helmet is more costly and requires

more maintenance than either a quarter- or half-mask.

For some jobs, such as abrasive blasting, a full facemask is inadequate. Abrasive blasters must wear an air-fed helmet. The helmet is made of rigid material that protects the abrasive blaster from ricocheting abrasives. Air is supplied to the helmet and flows down past your breathing zone.

Below are seven possible factors to consider when selecting a respirator. Mark the ones you think are correct.

What factors must be considered when you select a respirator? You may choose more than one.

___ 1. The **PERMISSIBLE EXPOSURE LIMIT** of the substance

___ 2. The **WARNING PROPERTIES** of the substance if it is a **GAS** or **VAPOR**

___ 3. The **NATURE** of the substance or **WHAT** the hazard is

___ 4. The **EYE IRRITATION** potential of the substance

___ 5. The **CONCENTRATION** of the substance

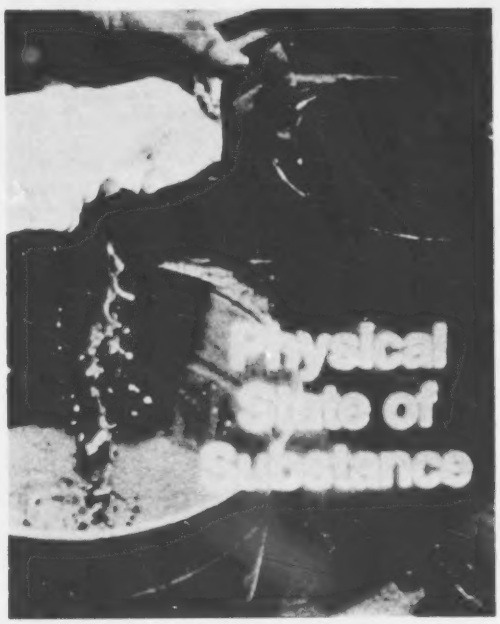
___ 6. The **SKIN ABSORPTION** potential of the substance

___ 7. The **PHYSICAL STATE** of the substance

The *nature* of the substance, Number 3, tells you what the hazard is. If the hazard is oxygen deficiency, then only a self-contained breathing apparatus or a combination airline respirator with an auxiliary self-contained breathing apparatus will do. If the hazard is a substance, then you must find out more about the hazardous substance.

Just knowing a substance is hazardous isn't enough. You must be able to determine Number 7, the *physical state* of the substance. Is it a gas, vapor, dust, mist or fume? If the harmful substance is a gas or vapor, then you know you can't use particulate-removing air-purifying respirators. In addition, by knowing the nature of the harmful substance and whether it is a gas or vapor, you can select the proper cartridge or canister to use with the air-purifying respirator. Number 2, the warning properties, is part of the nature of the substance. You should also know that if the hazardous gas or vapor has poor *warning properties*, then you should not use an air-purifying respirator. Gases and vapors with poor warning properties cannot alert you to respirator failure. If the substance is a particulate dust, mist, fume, smoke or fog, then you know you can't use a gas or vapor removing air-purifying respirator. By knowing the substance's physical state you can immediately eliminate some inappropriate respirators.

Knowing the nature of the substance and its physical state still does not give you enough information to select the proper respirator. What is your exposure to the hazardous substance? And what is a safe level of exposure?



In order to select a proper respirator, you must know the physical state of the hazardous substance. Is it a gas, vapor, mist, particulate or smoke?

The safe level of exposure can usually be determined by looking up Number 1, the *permissible exposure limit* set by OSHA. Appendix I of this manual includes the permissible exposure limits for each of the most widely used substances of the paint and allied trades.

Also, if the substance is flammable or combustible, you should look up the lowest air concentration at which the substance can ignite. If your exposure to the hazardous substance is at or below OSHA's permissible exposure limit, then you won't need a respirator. How-

ever, if Number 5, the *concentration* of the substance, is immediately dangerous to life and health, then you should eliminate all respirators except a positive pressure self-contained breathing apparatus or a combination positive pressure airline respirator with an auxiliary self-contained breathing apparatus. In addition, if the concentration of a flammable substance is at or above the lowest limit where an explosion could result, then you should use only the two respirators mentioned above: the positive pressure self-contained breathing apparatus or the combination positive pressure and airline respirator with an auxiliary self-contained breathing apparatus. In the back of your manual are the OSHA permissible exposure limits for many substances.

You still need to know your exposure to the hazardous substance even though your exposure may be below the level where the hazardous substance is immediately dangerous to life and health. Remember, filters, cartridges and canisters for air-purifying respirators are approved only up to a limited concentration of the hazardous substance. If the concentration exceeds the limit approved for the filter, cartridge or canister, then a supplied-air respirator or a self-contained breathing apparatus must be used.

The nature of the hazardous substance, its physical state, its warning properties, its concentration and the permissible exposure limit all determine respirator selection. Number 4, the eye *irritation* potential of the hazardous substance, will determine the type of facemask to use with the respirator. If the substance causes any eye irritation, then a full facemask, hood or helmet is used with the respirator.

Number 6, the *skin absorption* potential, must also be considered when selecting respirators and other personal protective devices. When skin absorption is a threat to your health, you may need an air-fed suit, or other protective clothing, to insulate your body completely from the hazardous substance.

All seven of the factors above must be considered when selecting a proper respirator: The *nature* of the substance. The *physical state* of the substance. The *warning properties* of the substance. The *concentration* of the substance. *Permissible exposure limit* of the substance. *Eye irritation* potential of the substance. And *skin absorption* potential of the substance.

Now you know some of the factors of respirator selection. Let's use them in a real work situation. Below are two situations. Using the information given in each situation, eliminate all inappropriate respirators. You do not have enough information to select the appropriate respirator, but you do have enough information to eliminate some of the inappropriate respirators.

SITUATION 1

You are cleaning a surface with an organic solvent. After a few minutes your eyes become irritated and water. On the solvent container you see:

Xylene

Warning! Flammable

Harmful if Inhaled

Irritating to the Eyes

Avoid breathing Vapor

You know from participating in this program that xylene *has warning properties at or below OSHA's permissible exposure limit* (PEL). Using the information given above, place a check mark by the *inappropriate* respirators. The key words are underlined.

___ **1. Gas and vapor removing air-purifying respirator with an ammonia cartridge and full facepiece**

___ **2. Single use dust mask respirator**

___ **3. Pressure-demand airline respirator with half-mask**

___ **4. Self-contained breathing apparatus with full facepiece**

___ **5. Gas and vapor removing air-purifying respirator with an organic vapor cartridge and a full facepiece**

SITUATION 2

You are working around a drywall taper who is mixing spackle. Quite a lot of dust is generated in the mixing process. On the bag the spackle came in you see:

Contains Asbestos Fibers

Avoid creating Dust

Breathing Asbestos Dust may cause Serious Bodily Injury

You know from participating in this program that Asbestos Dust does not Irritate the Eyes. Using the information given above, place a check mark by the inappropriate respirators. The key words are underlined.

___ **1. Gas and vapor removing air-purifying respirator with an ammonia cartridge and full facepiece**

___ **2. Single use dust mask respirator**

___ **3. Pressure-demand airline respirator with half-mask**

___ **4. Self-contained breathing apparatus with full facepiece**

___ **5. Gas and vapor removing air-purifying respirator with an organic vapor cartridge and a full facepiece**

___ **6. Powered particulate removing air-purifying respirator with full facepiece**

In Situation 1, using the organic solvent xylene to clean a surface, you eliminate respirator Number 1, a gas and vapor removing air-purifying respirator with an ammonia cartridge and a full facepiece. Xylene is an organic solvent; therefore, you would use an organic vapor cartridge—not an ammonia cartridge. Respirator Number 2 should be eliminated immediately. A single use mask is appropriate for particulates but not for gases and vapors. A pressure-demand airline respirator with a half-mask, Number 3, should also be eliminated. You need a full facepiece because the xylene vapors cause eye irritation. The self-contained breathing apparatus with full facepiece, Number 4, would be appropriate for protection against xylene vapors in excess of 100 times OSHA's permissible exposure limit. Number 5, a gas and vapor removing air-purifying respirator with organic vapor cartridge and full facepiece, would also be appropriate for protection against xylene vapors, but only up to 10 times OSHA's permissible exposure limit. You should have placed check marks next to Numbers 1, 2 and 3.

In Situation 2, working around a drywall taper using spackle containing asbestos, you can eliminate the gas and vapor removing air-purifying respirators, Numbers 1 and 5. Asbestos is a particulate, not a gas or vapor. Number 2, a single use dust mask is appropriate for asbestos exposure up to 10 times OSHA's permissible exposure limit. The pressure-demand airline respirator with half-mask, Number 3, and the self-contained breathing apparatus with full facepiece, Number 4, are appropriate for asbestos exposure in excess of 100 times OSHA's permissible exposure limit. Number 6, the powered particulate removing air-purifying respirator with full facepiece is also appropriate for protection against asbestos exposure, but only up to 100 times OSHA's permissible exposure limit. You should have placed check marks next to Numbers 1 and 5 only.

Self-contained breathing apparatus with full facepiece.

You now know about the different types of respirators and their limitations. You also know something about how to select the correct respirator. Are you now ready to select the correct respirator and face the hazards? Not quite. Your employer should train you in the proper usage of your respirator. This manual provides some basic respirator training, but your employer should fill in all the gaps.

Respirator Fit

Before going out with a respirator, you must be able to determine if the respirator fits properly. OSHA requires a good facial seal.

Leakage in an improperly fitted respirator is a very serious problem. In fact, an improperly fitted respirator gives you a false sense of security.

The fact that most respirators come in only one or two sizes adds to the problem of respirator fit. Most respirators are designed for men's faces. This causes a problem for many women, who on the average have smaller faces than men. The respirators won't fit. The immediate solution, and it applies to some men also, is to have the respirator custom fit.

Unusual facial structures, hollow temple, prominent cheek bones and deep skin creases also prevent a good facial seal. Again, custom fitting is the answer.

A beard prevents this respirator from forming a tight facial seal.

Beards, long sideburns or a couple of days of stubble will prevent the respirator from forming a tight facial seal. Frequent use of a sharp razor will cure this problem.

Eyeglasses can also prevent a positive facial seal. Respirators can be equipped with corrective lenses mounted inside the full facepiece. When corrective lenses are so mounted, it must be done by a qualified individual. You should also know that OSHA prohibits contact lenses in contaminated atmospheres when you are wearing a respirator.

The absence of one or both dentures affects the fit of the respirator, since without dentures your cheeks can be pressured inward, permitting contaminants to leak in.

Talking also causes contaminants to leak inside the respirator facepiece. Worn or improperly maintained respirators will not flex with the movement of your jaws. Keep the facepiece pliable by massaging it occasionally.

Now that you know about the problem of respirator facial seal, how do you go about checking to see if you have a tight fit? The negative and positive pressure tests are two quick and easy tests to check the facial seal of many respirators. These tests are not normally used for single use air-purifying filter respirators, such as those designed to protect you from low-level asbestos exposure.

To perform the negative pressure test, strap on the respirator and adjust it to fit snugly.

Performing the positive pressure test.

Block the end of the cartridge or canister with the palm of your hand so that air cannot pass through it. Inhale. If the facemask caves in, you have a tight seal. If it doesn't, contaminated air will enter the mask. If this is the case, readjust the mask and repeat the test until the facemask caves in.

To perform the positive pressure test, strap on the facemask and adjust it to a snug fit. Block the exhalation valve with the palm of your hand or thumb. Exhale. If the mask balloons out, you have a tight fit. If it doesn't, the facial seal is inadequate. Readjust the mask and repeat the test until the mask balloons out.

Performing the negative pressure test.

Communication — visual and audio — is another problem associated with respirators. Full facepiece respirators restrict vision and can fog-up. Visual communication is important, not only to accomplish the work but also to warn others about potential hazards. Oral communication is important for the same reasons. Even if the respirator is equipped with a speaking diaphragm, your voice is still distorted and communication impaired.

Respirator Maintenance

Now you know about the types of respirators, respirator selection, facial seal problems and problems with visual and oral communication while wearing a respirator. What else do you need to know?

As with any other tool, piece of equipment or machine, you need to know how to check for defects and how to care for and maintain the respirator in top operating condition. Read the manufacturer's recommended procedures for inspecting, cleaning and maintaining your respirator.

The four basic categories of care and maintenance of respirators are: 1) inspection for defects, including a leak check; 2) cleaning and disinfecting; 3) repair; and 4) storage.

The following checks are made when looking for defects: tightness of connections and regulator (if there is one) and

condition of facepiece, headbands, valves, connecting tube, filter, cartridge or canister. Rubber parts must be checked for elasticity and signs of wear. You should massage rubber parts occasionally to keep them pliable.

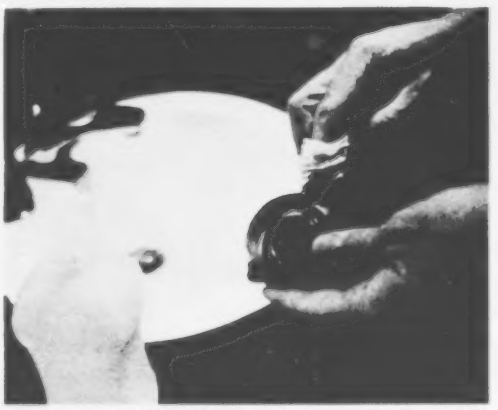
Cleaning and disinfecting are necessary after each individual use. The following procedure is followed when cleaning a respirator: 1) remove all filters, cartridges or canisters; 2) wash facepiece and breathing tube in the proper solution (some manufacturers have a cleaning solution available); 3) rinse completely in warm water; 4) air dry in clean area; 5) clean other parts as the manufacturer recommends; 6) inspect for damage and replace damaged parts; 7) install new filter, cartridge or canister.

After cleaning, store the respirator in a plastic bag or proper container away from dust, sunlight, heat, cold, excessive moisture or harmful chemicals.

If a part of the respirator needs replacing, only someone experienced in respirator repair should do it. The replacement part must be designed for the respirator in which it is installed.

Good records should be kept of inspections, cleanings and repairs for all respirators.

Your employer should assign one respirator to each worker who needs respiratory protection. If one respirator is assigned for one person, then the respirator should be cleaned and disinfected after each day's use. However, if a respirator is assigned to more than one worker, it must be cleaned and disinfected after each individual use—which may mean more than once a day. Emergency use respirators, such as self-contained breathing apparatuses, need to be inspected at least once a month and after each use. Emergency use respirators should be easily accessible to all workers. Markers designate the location of emergency use respirators.



Cleaning and disinfecting are necessary after each individual use.

Lack of maintenance of respirators is a very serious problem for construction workers. Usually you can't take the respirator home to clean it and often there are no facilities at the worksite in which you can clean your respirator. This is a problem you must settle with your employer.

The most important thing to remember when selecting a respirator or any other piece of equipment: select the equipment that will do the job and do it well.

HAZARDS OF THE PAINT AND ALLIED TRADES

Solvents of the paint trades, such as styrene, cause illnesses among painters and allied tradesworkers.

Chemicals of the paint trades are culprits responsible for death and suffering among painters and allied tradesworkers.

Consider the tragic death reported in the Mount Sinai School of Medicine study of a woodfinisher. For years he complained of chronic tiredness and weakness. As time passed, he experienced difficulty breathing; he developed high fevers, and he lost weight.

At age 59 when he died, his autopsy showed him to have had pneumonia, pleuritis, hyperplasia of the lymp nodes, nephrosclerosis, arteriosclerosis and many other problems as deadly serious and harmful to him as their names were big and difficult to pronounce.

His was not a natural death.

For years, while he happily worked making and painting furniture, several companions of his trade slowly and subtly poisoned him, taking his health and 15 years from his life.

According to the MSSM study, this is not an isolated case.

Each day, precious years of life and moments of health are robbed from the painters and allied tradesworkers by trade "companions." These killer companions are the substances used in the painting trades.

No doubt, many of you have long suspected some of the paint trade substances of detrimental activities: the sore throat and burning nose after a day of spraying or mixing paints and solvents; dizziness and exhilaration followed by nausea, a loss of appetite, headaches and sleeplessness; a cough that won't quit, shortness of breath, stomach problems and skin irritation, not to mention broken bones and maiming so prevalent in a "scaffold trade."

Yes, painters and allied tradesworkers are exposed daily to high concentrations of substances whose harms are not completely known. Below are five types of disorders and diseases. Rank them in the order you think they might affect you as painters and allied tradesworkers.

Following are five types of disorders and diseases. Rank them in the order you think they might affect you as painters and allied tradesworkers.

Disorders and diseases of:

___ a. The nose, throat, mouth, trachea, bronchial tubes and lungs

___ b. The stomach and intestines

___ c. The brain and the nervous system

___ d. The circulatory system, liver and kidneys

___ e. All other parts of the body, such as the skin

Heating seaming tape may release toluene diisocyanate (TDI), severely irritating the floorcoverer's respiratory system.

A single use dust mask, such as this, does not protect you while spray painting. An organic vapor respirator should be worn.

A paint maker loading pigment can be exposed to many harmful substances. Respiratory protection is essential.

Silica exposure from abrasive blasting can result in crippling and irreversible silicosis. An air-fed abrasive blasting helmet is an absolute must.

The disorders and diseases found among painters and allied tradesworkers fall in five major areas:

– the disorders and diseases of the brain and nervous system;

– the disorders and diseases of the nose, throat, mouth, trachea, bronchial tubes and lungs;

– the disorders and diseases of the stomach and intestines;

– the disorders and diseases of the circulatory system, liver and kidneys; and

– the miscellaneous disorders and diseases of all other parts of the body, such as the skin.

Disorders and diseases of the brain and the nervous system, due mainly to solvents, rank number one among painters and allied tradesworkers. In the MSSM study, 71 percent of the painters, 83 percent of the sandblasters and metal painters, 84 percent of the epoxy painters and 5 percent of the tapers reported disorders and diseases due mainly to solvents. Paint manufacturers had the lowest report of brain and nervous system disorders.

Chemical culprits held to blame most often for the brain and nervous system disorders are a long list of solvents, no doubt familiar by now to most painters and allied tradesworkers. In alphabetical order, that list includes alcohols, aliphatic hydrocarbons, aromatic hydrocarbons, esters, glycols, ketones, MEK, MIBK, methylene chloride, mineral spirits, naphtha, toluene, trichloroethylene, turpentine and xylene.

Chemical culprits responsible for brain and nervous system damage are the solvents of the paint and allied trades.

Primary disorders reported most often are pre-narcotic symptoms such as dizziness, light-headedness, unusual exhilaration, loss of balance and feeling "drunk" or "high."

Many of the painters and allied tradesworkers interviewed reported solvent-related industrial accidents. Usually these accidents occurred while a worker divided attention between two or more jobs, for example, balancing on a scaffold while controlling a sprayer hose.

Some also occur while driving.

The loss of peripheral vision —the ability to see to the side without turning the head or moving the eyes—is also a common complaint of solvent-intoxication. This narrowing of the field of vision may be the most important factor in accidents among solvent-intoxicated drivers and contributes to the chances of industrial accidents as well.

In addition to solvent-intoxication, MSSM fears that prolonged contact with solvents may lead to subtle, permanent and harmful changes in the central nervous system of the worker.

Finally, solvent exposures may be related to premature aging, minor mental deficits, some muscle spasms and the ability of an individual's mind to acquire, process and use sensory data—a polite way of saying solvents kill your brain.

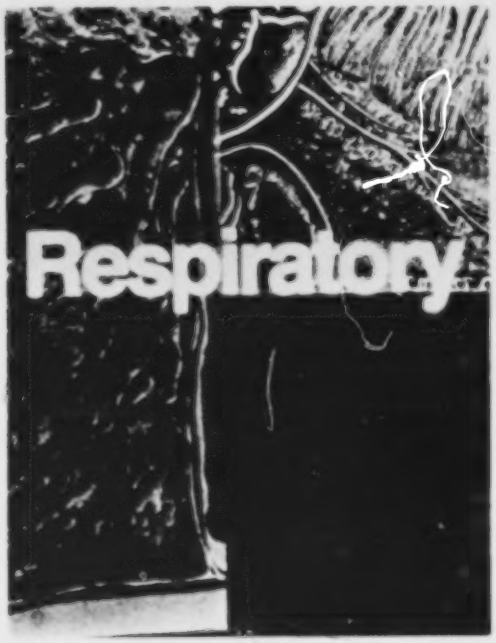
Though solvents are the most frequent cause of the neurological disorders and diseases among painters and allied tradesworkers, they are not the only ones, nor the most insidious.

Solvent intoxication may lead to foolish acts, such as this painter balancing on a scaffold.

Lead compounds cause severe neurological disorders and diseases in even relatively small quantities. So do antimony, sulfuric acid, manganese oleate and some zinc compounds.

Solvent intoxication has been an important factor of auto accidents involving painters, especially accidents immediately after work.

Next in frequency after diseases and disorders of the brain and central nervous system are respiratory disorders and diseases: those of the nose, throat, mouth, trachea, bronchial tubes and lungs.



Disorders and diseases of the respiratory tract are very common among painters and allied tradesworkers.

The disorders and diseases range from mild irritations of the respiratory tract, such as minor coughs, sore throat and stuffiness to major breathing problems which often result in death.

Most respiratory complaints among painters and allied tradesworkers stem from solvent and dust irritation of the "upper" and "lower airways."

The solvent and dust culprits responsible include the solvents alcohol, aliphatic hydrocarbons, aromatic hydrocarbons, benzene, chlorinated hydrocarbons, esters, ketones, toluene, turpentine and xylene; and the dusts from asbestos, silica, chromates, leads, zincs and assorted pigments. Other culprits include ammonia, antimony, boric acid, oxalic acid, shellac, sodium hydroxide and sulfuric acid.

These culprits affect the "upper airways"—the nose, mouth, upper throat and connecting air passages—among 45 percent of the painters, metal painters, sandblasters, floor tile workers and tapers.

Irritation of the "lower airways"—the bronchial and tracheal tubes and the lungs—affects 38 percent.

Among tradesworkers who use epoxies, 57 percent have upper airway irritations. Fifty-two percent have lower airway irritations. These are the highest percentages of irritations for any tradesworkers. Such high percentages of irritations indicate that the special chemicals epoxy workers use are more dangerous than the more conventional chemicals used among other painters.

Forty-five percent of painters, abrasive blasters, floorcoverers, tapers and metal painters have experienced upper airway irritation.

Thirty-eight percent of painters and allied tradesworkers have experienced lower airway irritation.

Breathing difficulties among painters and allied tradesworkers are troublesome problems that lower enjoyment of life and affect the quality of work for any tradesworker. They also lead to even greater concerns: chronic bronchitis, chronic emphysema, pulmonary fibrosis and cancers.

Chronic bronchitis is a disease characterized by severe tracheal and lung inflammation. The inflammation produces persistent coughs, soreness in the chest, difficulty in breathing and, in extreme cases, fevers. Thirty percent of all painters and allied tradesworkers tested by MSSM had chronic bronchitis. The highest percentage of chronic bronchitis is among sandblasters, 38 percent; followed by paint manufacturers, from solvent and pigment exposure, 33 percent; floor tile workers, from asbestos exposure, 29 percent; and general painters, from solvent, pigment and silica exposure, 28 percent.

Chest x-rays used by the MSSM detectives show small dense growths of abnormal cells among 20 percent of all examined workers. These growths are known as opacities.

The presence of opacities, MSSM specialists say, indicates a high likelihood of pulmonary fibrosis from dust exposure among painters. Pulmonary fibrosis, including silicosis and asbestosis, hinders the ability of the lungs to exchange oxygen and carbon dioxide in the bloodstream.

Among sandbasters, 8 percent have opacities; once again, especially due to the large amounts of silica to which they are exposed.

Other x-ray abnormalities found among painters and allied tradesworkers include "pleural" changes. The pleura consists of large sacks filled with a lubricating liquid that enfold and protect the lungs. When irritated, the pleura thickens and calcifies. This restricts the lungs from expanding to full capacity, creating breathing difficulty. Pleural changes are found in 10 percent of the painters' x-rays.

The lung and pleural abnormalities among tapers may be the result of asbestos and silica exposures. Cigarette smoking doesn't help either.

Among tapers, 48.1 percent of the x-rays show lung and pleural abnormalities. Four percent of the tapers also have

pleural fibrosis, a disease in which thickening of the pleural tissue destroys the pleural cavity. The MSSM study found that the x-ray abnormalities among asbestos insulation workers are nearly the same as among tapers, clearly suggesting that asbestos is the culprit responsible for taper x-ray abnormalities.

Further, the number of abnormalities increased with the number of years of exposure. The increase in abnormalities is greatest among tapers with more than ten years' experience.

The third greatest problem among painters and allied tradesworkers is stomach and intestinal disorders and diseases. Among the workers examined in the MSMM study, they occurred in 29 percent of the metal painters and sandblasters; 26 percent of the epoxy-exposed painters; 21 percent of the general painters; 16 percent of the titanium pigment manufacturers; 7 percent of the paint manufacturers, and 1 to 3 percent of the other tradesworkers. The stomach and intestinal disorders most common among painters and allied tradesworkers are nausea, vomiting and loss of appetite.

The culprits allegedly responsible include the alcohols, aliphatic hydrocarbons, esters, glycols, ketones, methylene chloride, mineral spirits, naphtha, sulfuric acid mists, toluene, turpentine and xylene.

The fourth greatest problem among painters and allied tradesworkers is diseases and disorders of the circulatory system, liver and kidneys.

Liver abnormalities among the examined painters and allied tradesworkers occur in less than 10 percent of the painters.

Enlargement, often the first sign of an unhealthy liver, occurs among 4 to 6 percent of the painters.

Liver damage among painters and allied tradesworkers is often due to solvent exposure and not excessive drinking.

Blood tests taken by the MSSM detectives uncovered anemia among 11 percent of the general painters, 8 percent of the paint manufacturers and 7 percent of the tapers.

Anemia occurs when the number of red blood cells responsible for carrying oxygen and nutrients to the many parts of the body are too few. Symptoms of anemia are headaches, weakness, dizziness, drowsiness, fever and stomach problems.

Abnormal white blood cell counts occur among 10 percent of the painters, 4 percent of the paint makers and 2 percent of the tapers. The white blood cells are the "defenders" of the body. They attack any invading bacteria or virus. If the number of white blood cells is low, the person will be susceptible to many diseases. If the number of white blood cells is high, it indicates the presence of some disorder which the body is combating.

Finally, 21 percent of epoxy painters, 5 percent of other painters and 10 percent of the titanium manufacturers have troublesome skin rashes, irritations and dermatitis.

Though the disorders and diseases of the stomach and intestines, the liver, the blood and the skin of painters and allied tradesworkers do not occur with the same frequency as the disorders and diseases found among the brain and nervous system and the respiratory system, the potential for harm is greater than the figures show.

Alcohols, commonly used as solvents, cause severe skin irritations and dermatitis if the user is not careful to avoid prolonged skin contact. Further, prolonged inhalation, or skin contact, can cause vomiting and nausea.

Aliphatic hydrocarbons defat the skin, causing severe irritation and dematitis. They, too, cause vomiting and nausea from prolonged inhalation of vapors.

The circulatory system may be damaged by many solvents, especially benzene.

Benzene blisters the skin and causes dermatitis, palpitations of the heart, anemia and leukemia (cancer).

Glycols damage the kidneys either from prolonged inhalation of vapors or prolonged skin contact.

Aromatic hydrocarbons, in addition to causing skin irritation and dermatitis, absorb through the skin to disrupt the liver and the kidney functions and create blood and bone marrow disturbances.

Toluene, xylene and methylene chloride irritate the skin and may cause nausea and vomiting.

Naphtha, inhaled or absorbed through the skin, is responsible for anemia.

These are just the solvents. Among paint pigments, dusts and other materials used by painters and allied tradesworkers are many more chemical culprits. For example, the pigment cadmium degenerates the kidneys, alters the function of the liver and affects the blood cells and the bone marrow.

The chromates, very common in yellow, orange or green paints, cause chronic dermatitis, ulcers, anemia, gastrointestinal disease and cancer.

Antimony degenerates the kidneys, the liver and the heart; causes cramps, diarrhea, vomiting and skin irritation and dermatitis.

Asbestos causes pulmonary fibrosis and cancer of the stomach, the colon and the rectum.

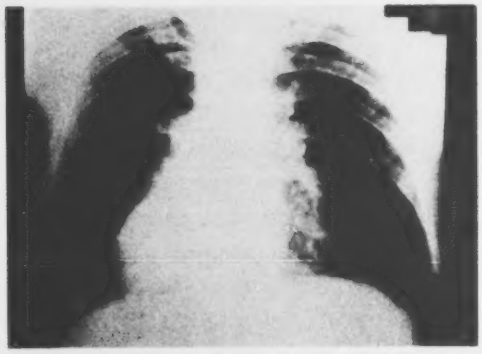
Lead, perhaps the single most documented of the paint trade culprits, is responsible for anemia, intestinal upsets, arteriosclerosis and skin irritation and dermatitis.

Sulfuric acid causes digestive disturbances, burns, skin irritations and eats the enamel from the teeth of workers.

Ammonia is responsible for chemical burns, kidney congestion, vomiting and gastritis.

And do not forget, these culprits also cause other disorders and diseases.

The combined findings of respiratory symptoms, chronic bronchitis, opacities, pleural changes, abnormal sputums and all other disorders and diseases strongly suggest that chemical culprits do present a significant hazard to the health and well-being of painters and allied tradesworkers.



Chest x-rays reveal many of the illnesses of the paint trades, including cancer, silicosis and asbestos.

Two things are certain:

— the longer a tradesworker is exposed to the culprits of the trade, the greater the harm, and

— the higher the concentration to which the tradesworker is exposed, the greater the harm.

Consequently, the message is clear. Avoiding lengthy and concentrated exposure to these chemical culprits will be beneficial to worker health and well-being.

You are members of the paint and allied trades. These problems are your problems. Following are nine things you can do to protect yourself. Check the ones you think will work for you.

Following are several things you can do to protect yourself from lengthy and concentrated exposure to the chemical culprits of the paint and allied trades. Check the ones you think will work for you.

___ **1. Leave the trade.**

___ **2. Forget about the problems.**

___ **3. Refuse to work until the problems are solved.**

___ **4. Learn about the problems.**

___ **5. Make sure that all the controls are on the job.**

___ **6. Substitute safe products for unsafe products.**

___ **7. Take regular coffee breaks.**

___ **8. Install barriers between you and the problems.**

___ **9. Use personal protective equipment.**

Did you check Number 1, leave the trade? That would work. But it is not often very practical. Most people can't afford to quit their jobs. Most people wouldn't work if they didn't have to. Besides, every job is dangerous. Even office workers can suffer asbestos exposure. Let's face it, quitting isn't the best answer most of the time.

Then maybe Number 2 appeals to you. Just forget about the problems. You'll get used to them. They'll stop bothering you. And everything will be okay. How many visitors or strangers that come onto your jobsites remark about the terrible smell? Have you told them they'll get used to it? You did, afterall. Not quite. All that's happened is the nerves in your nose have lost their ability to tell you that the vapors are present. The problem hasn't gone away. It's just blown one of your sensing circuits. The problem is still there. Many an ostrich has hidden its head from danger only to be eaten by dingoes. The problems won't go away—but you might.

The ostrich approach won't let you off cheaply or painlessly. Diseases and disorders do not discriminate between those who did not know and those who did not care.

Speaking about knowing, did you check Number 4, learning about the problems? Those who know will go the way of those who don't know and don't care —if they don't act on what they know. Knowing how to do anything—from fixing a car to using a respirator—is worthless if the knowledge isn't put to use. So knowing is correct only if you checked 5, 6, 7, 8 and 9, and plan to follow through.

Number 5 is correct; it's something you can do. But anyone who works in the trade understands that the control of health and safety hazards on the jobsite is the last area to get attention. Even if it were the first, many hazards are unknown until someone dies or is hurt by the problem. And usually a hundred have to die before anyone really notices it. So complete control is something we dream about, that we strive to get and hope for.

But it is not anything we expect today. Substituting safer products is something we can do — sometimes. Once again, there are so many new chemicals—and many, many old ones —that we know little or nothing about. But there are some that we do know should not be used and for which we do have safer substitutes. Below are several solvents. Choose the three harmful solvents from the list on the left and connect them up to the substitute solvent on the right.

Choose the three most harmful solvents from the list on the left and connect each with the substitute solvent on the right.

___ benzene	a. styrene
___ alcohol	b. methyl isocyanate
___ methyl ethyl ketone	c. toluene
___ carbon tetrachloride	d. ethylene glycol
___ trichloroethylene	e. methylene chloride
___ naphtha	

Did you find this a hard test? You are not alone if you did. The names alone are mind boggling. But remembering these three names and their substitutes might save your life.

Benzene, carbon tetrachloride, trichloroethylene are three very dangerous solvents. Each has been linked to cancer. No known safe level of exposure exists for benzene, carbon tetrachloride and trichloroethylene. And there are solvents that can be used in place of them that will do the job. For benzene, use toluene. But be careful, toluene often contains benzene as a contaminant. For carbon tetrachloride and for tricloroethylene, use methylene chloride.

Benzene, carbon tetrachloride and trichloroethylene. Remembering these three substances and their substitutes will be easier and less painful than the consequences you suffer by using them—so take time to remember them. For your own sake. For the sake of your family. For the sake of those who work with you.

Now flip back a page and let's finish our first list. We have decided that if you don't leave the trade, you can't forget about the problems; that learning about the problems only works if you do something about them; and that we can't expect all the controls to be on any jobsite—even though that's what we want. We have decided that substitution isn't going to work for everything, but that there are some things we can substitute for like benzene, carbon tetrachloride and trichloroethylene.

Number 7 is engineering control. Engineering control is the second best way of controlling exposure to hazardous substances. If you can't substitute a safe substance, you will try to engineer the hazard away. This usually means putting up a barrier, like this enclosed blasting cabinet to contain the contaminant. Unfortunately, engineering control is limited in the paint and allied trades. First, it's very costly and usually requires an investment in equipment that can't be justified for the temporary jobsite. This is not always the case though.

Below are five engineering controls you should find on your jobsite. Check the ones you have seen and circle the ones you have used. If you don't have five x's and five circles, you are not getting the protection you should from available engineering controls.

Below are five engineering controls you should find on your jobsite. Check the ones you have seen and circle the ones you have used.

___ **Ventilation systems**

___ **Machine guards**

___ **Solvent cans with resealable lids**

___ **Portable partitions around spray painting**

___ **Dead-man control switches on power tools**

Now, how about Number 8--regular coffee breaks. Believe it or not, they do help. First, they reduce fatigue, break up the day and give you time to think about what you are doing. They also allow your exposure to be reduced for a short duration of time—if you aren't foolish. Use your break to get out of the area where you are working. Breathe some fresh air. Stretch. Look around. And if you hit the snack wagon, your lunch bucket or any other food source, don't forget to wash your hands. Otherwise, you'll end up eating or drinking some substance that you really would rather avoid. Also, keep the lunch bucket out of the work area.

By the way, coffee breaks are only one of the many administrative controls that can help you reduce your exposure. Below are five more administrative controls. Circle the ones that you have ever used.

Following is a list of administrative control measures that can help reduce your exposure to the chemical culprits of the paint and allied trades. Circle the ones you have used.

___ Job rotation

___ Vacations

___ Work staggering

___ Enforcement of OSHA regulations

___ Safety and health committees

___ Other:_____

Every time you use one of these administrative controls, you are reducing your duration of exposure to hazardous substances. Perhaps it will mean better health for you in years to come. So any time that you can use one of these administrative controls, do so—it's like leaving the trade for just a while. Twenty minutes a day away from the exposure mounts up fast—to about 80 hours a year. And that means 80 hours less exposure for you. It's nothing to laugh at.

For painters and allied tradesworkers, Number 9, personal protective equipment is often the best answer.

Below is a list of personal protective equipment. Check what you think is the proper equipment, and circle what you use.

Below is a list of personal protective equipment. Check what you think is the proper equipment and circle what you use.

___ **Single use dust respirator**

___ **Air-fed abrasive blasting helmet**

___ **Ear plugs or muffs**

___ **Air-purifying respirator with organic vapor cartridge and paint spray filter**

___ **Paint spray hood**

___ **Neoprene gloves**

___ **Safety shoes**

___ **Safety belt and lifeline**

___ **Hard hat**

___ **Airline respirator**

___ **Eye goggles**

___ **Self-contained breathing apparatus with full facepiece**

___ **Leather apron**

___ **Long-sleeved shirt or blouse**

___ **Plastic faceshield**

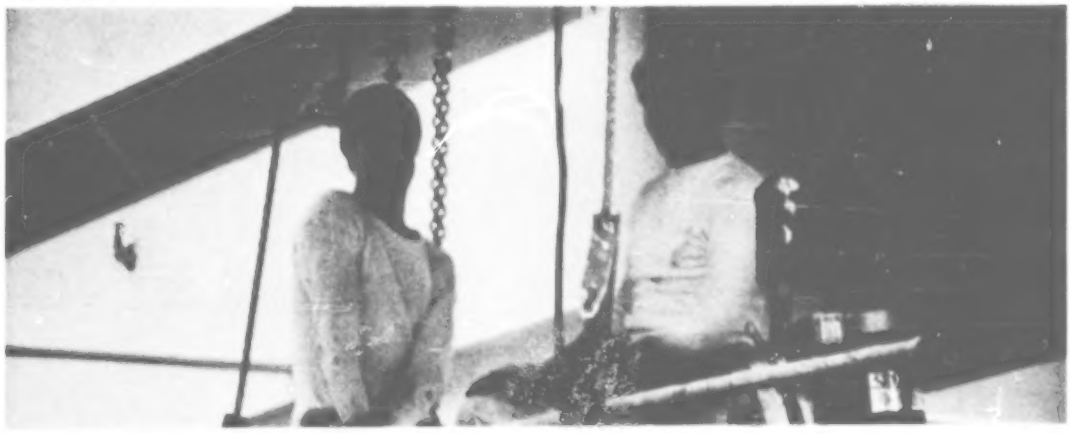
All the answers are correct. If you have more x's than circles, then you are not protecting yourself as much as you know you can. If you have less than 15 x's and circles, then you are not protecting yourself as much as you should. What are you going to do about it? You may either leave the trade or forget about the problems—which we have already seen isn't practical or wise—or you can follow through.

Oh yes, the last alternative of the list, refusing to work, has been left to last. If you have done all you can, which means using all the measures in this section, and yet you find your job unhealthy and unsafe, then your last resort is to refuse to work. Nine out of ten times you'll just end up losing your job. But you'll still have your life.

When should you take such a drastic measure as refusing to work? Only after you have done all that you can, through all other means, to make your jobsite safe and healthful.

With proper protection you . . .

. . . and your co-workers can live to a ripe old age and enjoy your retirement.



Think about death and injury in the workplace. What word comes quickly to mind?

"Accident."

Accident is a word used often. What do you think it means in relation to the workplace? Circle the definition you think comes closest to the meaning of workplace accident.

1. Workplace accidents are acts of God.

2. Workplace accidents are a random ordering of events that leads to perfunctory completion of work.

3. Workplace accidents are dangerous conditions.

4. Workplace accidents are events or situations that interrupt normal work activity and may cause personal injury, death or property damage.

Balancing on a beam, like this, is inviting an accident.

ACCIDENT CAUSATION:

You don't arrive to work in an ambulance, don't leave in one.

WHAT CAUSES ACCIDENTS

A workplace accident usually means Number 4, an event or situation that interrupts normal work activity and that may cause personal injury, death or property damage.

The workplace is loaded with *potential* accident situations. Yet accidents do not always happen. An old adage applies here: Accidents are rare events. This is comforting if only because it means many workers are spared injury more often than they are harmed.

Even though accidents and their resulting injury and damage do not always happen as a result of potential hazards, employees and employer must still take responsibility for finding the sources of hazards in the workplace.

But until a damaging workplace accident does happen, employers and employees often do not act to prevent accidents.

What do you think are the causes of workplace accidents?

Below are 18 possible causes of workplace accidents. Which do you think are true causes?

Workplace accidents are caused by:

___ 1. improperly guarded machinery

___ 2. natural side-effect of production

___ 3. poor eyesight

___ 4. a worker refusing to wear a respirator in a known toxic environment

___ 5. worker carelessness

___ 6. flying particles

___ 7. chance

___ 8. slippery walking and working surfaces

___ 9. a new worker in a paint plant failing to ground a vat before draining the solvent

___10. a worker with a hearing impairment

___11. accident-prone workers

___12. fatigued or tired workers

___13. your number is up

___14. a worker pouring flammable liquids in the presence of an unseen open flame

___15. a worker removing the guard from a machine

___16. improper tool and equipment design

___17. the difficulty of a job operation

___18. the speed required to meet job demands

First, let's look at the causes that are not true:

Number seven, "chance" does not cause accidents. Unfortunately, chance is often blamed for causing accidents. Accidents are blamed on chance because it takes away part of our responsibility. But you must accept immediately that *no* workplace accident happens by chance, if you are to prevent accidents. You must accept that all accidents have causes which can be discovered and corrected by you and your employer. This rules out chance.

Another cause to be immediately rejected is Number 11, the "accident prone" individual. The supporters of this theory write off workplace accidents that happen to a single worker to that worker's proneness to cause accidents. This theory of accident causation says that some people are doomed or programmed to have accidents as a natural part of life. Research shows that most accidents are caused by multiple factors in the workplace, not by "accident prone" people.

Number 13, the "number is up concept," another common belief about workplace accidents, is also a false cause. Fatalists believe in the "number is up concept." Fatalists believe we are born with a number. When the time comes and your number is drawn, you will be either killed or injured despite any actions you take to avoid it. In fact, accidents *can* be avoided if you and your employer take the proper action.

Yet another erroneous view is Number 2, that workplace accidents are a "natural side effect" of production. This suggests that production contains certain risks and demands on workers which will *inevitably* take their toll in human suffering, death and damage. Thus, accidents are a way of life for working people. Fortunately this is not true. Accident rates can go down as production rates go up — when it pays to keep them down.

Number 5, "worker carelessness" as a cause of workplace accidents, receives the most publicity. The supporters of this idea use the label of carelessness to explain all accidents which are in fact caused by a multitude of workplace factors. They state that if workers try harder, accidents won't happen. When the worker watches what he or she is doing and is careful, they say, almost all the injuries and deaths associated with work activities can be avoided. Carelessness as a cause of workplace accidents is a simplistic explanation that only scratches the surface.

Many workers labeled as careless are simply unaware of their mistakes or errors. They don't fully understand the nature and consequences of the risks they take. A worker is more likely to take a risk when not completely aware of the aftereffects. Inexperience and lack of knowledge cause fear

97

which can lead to accidents. And often the worker has no control over exposure to hazards.

The other 13 causes of accidents given in your manual are the correct ones. Closer examination reveals that they fall into two categories: those of unsafe acts and those of unsafe conditons.

The truth is, all workplace accidents are caused by one or more unsafe acts; by one or more unsafe conditions, or by some combination of unsafe acts and unsafe conditions. Responsibility for eliminating unsafe acts and unsafe conditions is shared by employer and employee. Chance, accident-proneness, your number is up, the natural side effect of production and worker carelessness are only excuses used by employers and employees who try to avoid responsibility for a safe and healthful workplace.

Unsafe acts are human failure or worker error. Unsafe acts can result when a worker is physically unsuitable for a job. Number 3, a worker has poor eyesight; Number 10, a worker has a hearing impairment; and Number 12, a worker is fatigued, all can make a worker physically unsuitable for a particular job and can lead to accidents.

Another kind of unsafe act is a worker's wanton disregard for rules, procedures and proper methods. Examples of these acts in the 18 choices in your manual are Number 15, a worker removes the guard from a machine, and Number 4, a worker refuses to wear a respirator in a known toxic environment. Some unsafe acts are not as clearly seen as those caused by physical unsuitability or a worker's wanton disregard for the rules. These are unsafe acts in which the worker causes an accident but without a purposeful disregard for regulations and procedures: Number 14, a worker pours flammable liquids in the presence of an unseen open flame, and Number 9, a new worker in a paint plant fails to ground the vat before draining solvent. A principal reason for accidents is workers often do not know that what they are doing is unsafe or incorrect. This is called workplace-induced worker error.

Unsafe acts such as working below a co-worker without your hard hat and washing hands with solvents must be avoided to reduce accidents.

Other workplace-induced worker errors can be caused by Number 16, improper tool and equipment design, Number 17, the difficulty of an operation or Number 18, the speed required to meet job demands.

The major misunderstanding of the part worker error plays in

causing accidents stems from the mistaken belief that: worker error is caused only by lapse of attention, and if workers tried harder, performance would be error free. But humans are not perfect. Still, workers and employers have the responsibility for a safe and healthful work environment.

In contrast to unsafe acts, unsafe workplace conditions are defects, errors in design or faulty planning. These include Number 8, slippery working surfaces, Number 6, flying particles, and Number 1, improperly guarded machinery.

A more reasonable view for reducing workplace accidents recognizes that worker errors result from the interaction between a person and a workplace situation. The combination of unsafe acts and unsafe conditions create the potential for workplace accidents that cause personal injury, death or property damage.

These examples of unsafe acts and unsafe conditions in the workplace play significant roles in the making of an accident. If you and your employer practice pinpointing likely error situations and designing the workplace around them, you can reduce injuries and illnesses to a tolerable level.

Unsafe conditions, such as slippery working surfaces and unguarded machinery, lead to accidents and are illegal.

On a cold January day, two painters are at work on a scaffold in a basement. The scaffold has no guardrails and no toeboards. Nearby is a gas heater which is not vented properly. The concentration of paint and solvent vapors and the carbon monoxide from the heater intoxicate the painters. They become light-headed and lose muscular control. Before long, one of the painters leans too far forward and falls from the scaffold to the floor below.

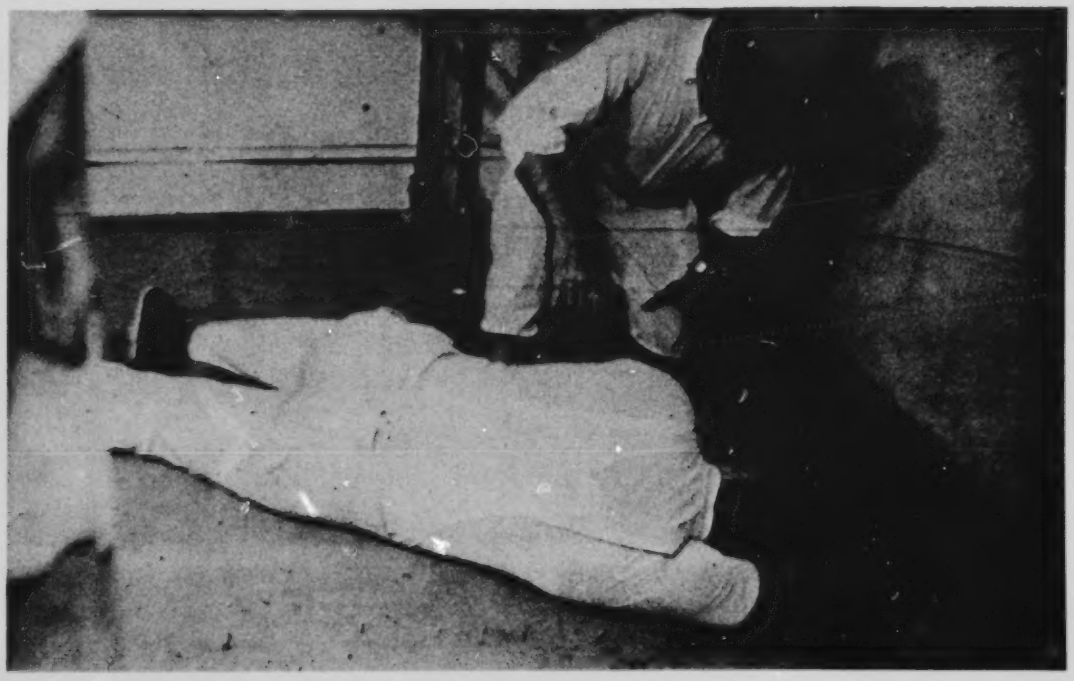
In this accident, we see both unsafe acts and unsafe conditions. Can you identify which are unsafe acts and which are unsafe conditions? Read each item below and then circle whether it is an unsafe act or an unsafe condition.

1. The toxic environment created by the carbon monoxide and paint and solvent vapors.
   Circle one:
   unsafe act unsafe condition
2. No guardrails and toeboards on the scaffold.
   Circle one:
   unsafe act unsafe condition
3. The workers failed to provide adequate ventilation.
   Circle one:
   unsafe act unsafe condition

One unsafe condition is the toxic environment created by the solvent vapors and the carbon monoxide. Another unsafe condition is the absence of guardrails and toeboards from the scaffold, which allowed the painter to fall off.

The unsafe act, or worker error, is that the painters did not take time to provide sufficient ventilation in their work area.

No guardrails, no ventilation and an enclosed room —the makings of an accident.



100

Hazards and Accidents

A hazard is any condition in the workplace which, by itself or in combination with other factors, can cause undesired deaths, injuries, illnesses and property damage.

Hazards are divided into two broad groups.

One group is *safety hazards*, conditions in which workers may be injured or killed. Examples of common safety hazards are faulty electrical wiring, platforms with no railings, unguarded gears, power grinders without shields and improperly stacked materials. Countless similar job situations cause workers to be electrocuted, burned, cut, crushed, blinded or otherwise maimed.

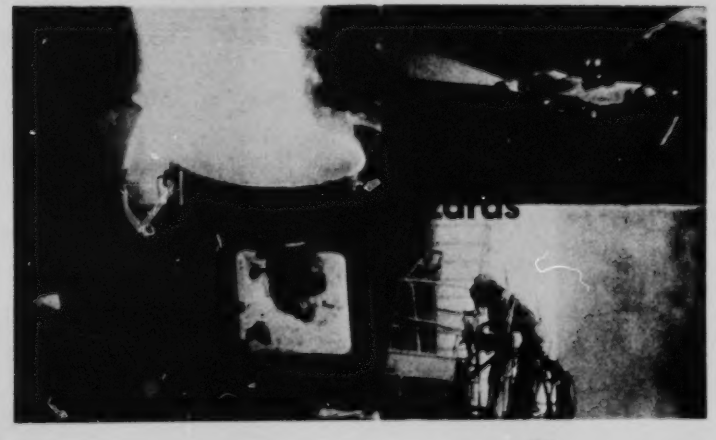
The other group is *health hazards*, which are more complicated than safety hazards. A health hazard is a job situation in which a worker is poisoned or made sick by harmful substances such as dusts, fumes, vapors, particulates and gases or other hazards such as heat, noise, x-rays and microwaves.

Safety hazards may be created by unsafe acts, such as standing on a guardrail, or by unsafe conditions, such as a scaffold without guardrails.

Examples of illnesses caused by health hazards are headaches from carbon monoxide; skin rashes or dermatitis from solvents; lung diseases from the inhalation of dust, vapors, fumes, mists and particulates; and hearing loss from noise levels above safe limits.

A single condition or substance can be both a health hazard and a safety hazard. Solvent fumes are a good example. If inhaled, these fumes cause lung irritation. Depending on the dose and duration of exposure,

Health hazards may also be caused by unsafe acts and unsafe conditions.



101

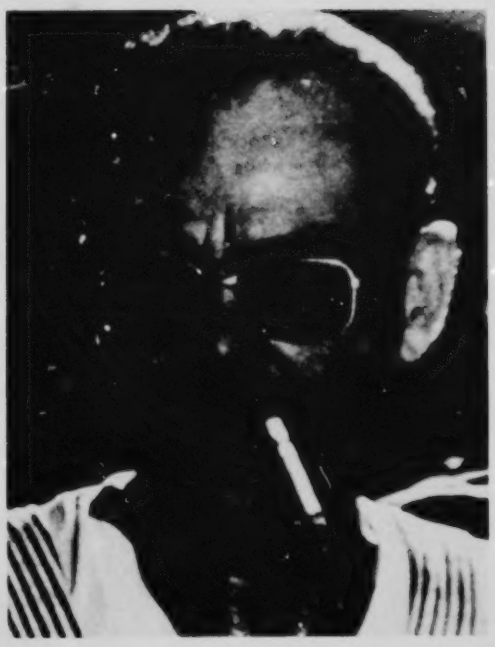
this irritation can lead to chronic illnesses. In this case, solvent fumes are a health hazard. If solvent fumes are in a closed room near an open flame, they may ignite—causing severe injury and death to workers and extensive damage to the workplace. In that case, the fumes are a safety hazard.

A health hazard can also intensify a safety hazard. Remember the situation where the painter in the basement fell off the scaffold. The carbon monoxide and solvents dulled the painters' senses—a health hazard—which contributed to his fall from the scaffold with no guardrails — a safety hazard. Workers suffering drowsiness, poor coordination or confusion caused by health hazards are more likely to make mistakes. Mistakes made in areas where safety hazards exist are more likely to cause harm to workers and others.

When the total effect of two combined hazards is greater than the sum of the effects taken separately, this is called *synergistic effect*. An example of synergistic effect is asbestos inhalation and cigarette smoking. Asbestos can cause cancer, and cigarette smoking can cause cancer. The person who inhales asbestos and smokes cigarettes is five to ten times more likely to get cancer than the person who only inhales asbestos or the person who only smokes cigarettes.

Following are three sets of six situations. Find the situations for your trade. Read each description and then check whether it is a safety hazard or a health hazard or a combined safety and health hazard. After deciding what type of hazard it is, then check whether you think it is created by an unsafe act or by an unsafe condition or by both an unsafe act and an unsafe condition.

Cigarette smoking and asbestos exposure: a "synergistic" relationship resulting in lung cancer.



GENERAL PAINTERS

Following are six situations. Read each description and check whether it is a safety hazard or a health hazard or a combined safety and health hazard. After deciding what type of hazard it is then check whether it is created by an unsafe act or by an unsafe condition or by both an unsafe act and an unsafe condition.

1. **A drywall taper does not heed warnings and keeps his unsheathed taping knife in the hip pocket of his work pants.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

2. **A painter is sent into a new work situation without supervision. The new room is filled with carbon monoxide from an improperly vented gas heater.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

3. **A painter does not properly hook his paint bucket to his ladder. Another painter without a hard hat is mixing paint beneath the ladder.**
   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

4. **An electrician working near a painter drops a live wire onto the painter's metal scaffold.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

5. **A sandblaster is required to work on a scaffold that is not tied-in properly to the building. The wind gusts and causes the entire scaffold to fall away from the building.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

6. **Five painters are working in a closed room without ventilation and heated by a gas heater. The lids have been left off their solvent and paint containers.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

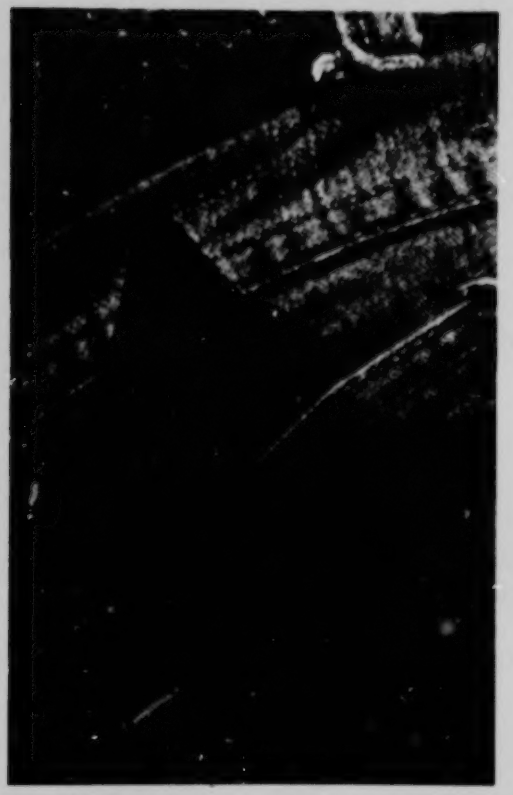
   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

10.

GENERAL PAINTERS



An unsheathed knife in a taper's workpants is a safety hazard created by an unsafe act.

Situation Number 2, in which a painter is sent without supervision into a new work situation, a room filled with carbon monoxide, represents a health hazard. Carbon monoxide cannot be detected by the senses and if this worker remains in the room, he will become sick, dizzy and confused and may lose consciousness. If he is not discovered, he may die. In this case, the unsupervised worker did not know that a hazard was present. The health hazard here results from inadequate supervision and from a carbon monoxide-filled room — both of which make a dangerously unsafe condition.

Situation Number 1 in which a drywall taper keeps his unsheathed taping knife in the hip pocket of his work pants is a definite safety hazard. If the taper squats down suddenly, he may receive a very severe puncture wound—an immediate injury. Because the taper did not heed warnings of the danger of carrying his knife in his pocket, this situation is an example of a worker's wanton disregard for rules and proper methods. This safety hazard is clearly caused by an unsafe act.

Working in an enclosed room filled with carbon monoxide is a dangerous health hazard created by an unsafe condition that can cause you to black out—or kill you.

105

In situation Number 3, a painter does not properly hook his paint bucket to his ladder. This, of course, is a safety hazard. It may or may not have been a wanton disregard of proper methods; it might have been a workplace-induced error. In either case, it represents an unsafe act. It would be an unsafe condition only if the hook were improperly designed or defective. The painter who mixes paint beneath the ladder without a hard hat represents a blatant example of a worker's wanton disregard for rules and proper methods. Such wanton disregard creates an obvious safety hazard, especially since a hazard already hangs above this painter's head. Both hazards result from unsafe acts and can easily cause injury or death.

A live wire on a metal scaffold: a definite safety hazard created by both an unsafe act and an unsafe condition.

An improperly secured paint bucket is a safety hazard created by an unsafe act, but is an unsafe condition to the workers below the paint bucket.

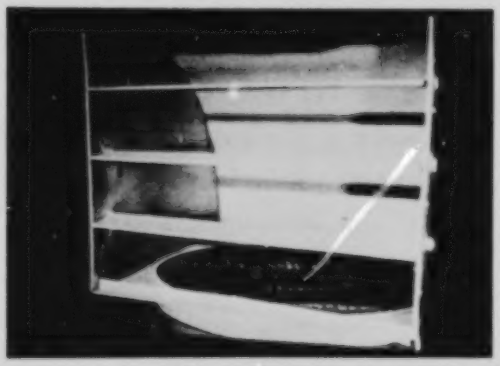
In situation Number 4, an electrician drops a live wire onto a painter's metal scaffold. Once again, this is a safety hazard. Zap! the painter is electrocuted. The hazard is caused primarily by an unsafe condition and also most likely by an unsafe act. First, the workplace was not properly designed—an unsafe condition. Either the painter should not have been working on a metal scaffold near live wiring or the wiring should not have been energized. If the electrician dropped the live wire through improper handling, this is an unsafe act. It is also correct to say that the electrician's handling of a live wire near a metal scaffold where painters work is an unsafe act.

100

Working on a scaffold that is not properly tied-in to the building is a safety hazard created by an unsafe condition.

When a sandblaster is required to work on a scaffold that is not properly tied-in to the building, as in situation Number 5, the hazard clearly represents an unsafe condition. In this situation, the worker has little control over the condition if he is required to climb the scaffold. The unsafe scaffold can be toppled by a strong gust of wind, causing injury or death—a very serious safety hazard. Management contributed to this safety hazard by not supervising the erection of the scaffold and by requiring the worker to climb the unsafe scaffold, but by climbing the scaffold the worker committed an unsafe act.

In situation Number 6, five painters are working in a closed room heated by a gas heater and filled with fumes from open solvent and paint containers. The unvented gas heater and the toxic fumes pose a very unsafe condition. This unsafe condition results in both a safety hazard and a health hazard. The fumes are a safety hazard because they could reach the flash point or could be ignited by the heater, causing burns and other damage to the five painters. The painters may become dizzy and confused through inhaling the fumes and would therefore be more likely to make mistakes which cause accidents. The fumes and the exhaust from the heater also present a health hazard. The health hazard may be acute if any of the painters suffers carbon monoxide poisoning or is overcome by toxic fumes. Or the health hazard may be chronic if the painters frequently work in such a toxic environment and develop chronic illnesses as a result. The safety and health hazards in this situation, caused by an unsafe condition, are worsened by the unsafe act of the painters themselves: they did not open a window or otherwise ventilate the room to eliminate the toxic substances.



Working in an enclosed room with paint fumes and heated by a gas heater is a safety and health hazard created by both an unsafe act and an unsafe condition.

FLOORCOVERERS

Following are six situations. Read each description and check whether it is a safety hazard or a health hazard or a combined safety and health hazard. After deciding what type of hazard it is, then check whether it is created by an unsafe act or by an unsafe condition or by both an unsafe act and an unsafe condition.

1. **A floorcoverer does not heed warnings and keeps his unsheathed knife in the hip pocket of his work pants.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

2. **A floorcoverer is sent into a new work situation without supervision. The room is filled with carbon monoxide from an improperly vented gas heater.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

3. **A painter does not properly hook his paint bucket to his ladder. A floorcoverer passes below without a hard hat.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

4. A floorcoverer cuts the ground plug off his carpet seamer.

   This is a

   ___ safety hazard

   ___ health hazard

   ___ combined safety and health hazard

   This hazard is created by

   ___ an unsafe act

   ___ an unsafe condition

   ___ an unsafe act and an unsafe condition

5. A floorcoverer without a respirator is working in a room where a drywall taper is mixing and sanding asbestos-containing spackle.

   This is a

   ___ safety hazard

   ___ health hazard

   ___ combined safety and health hazard

   This hazard is created by

   ___ an unsafe act

   ___ an unsafe condition

   ___ an unsafe act and an unsafe condition

6. A floorcoverer is removing asbestos felt with an alcohol solution in a closed room. The room is heated by an unvented gas heater.

   This is a

   ___ safety hazard

   ___ health hazard

   ___ combined safety and health hazard

   This hazard is created by

   ___ an unsafe act

   ___ an unsafe condition

   ___ an unsafe act and an unsafe condition

FLOORCOVERERS

Situation Number 1, in which a floorcoverer keeps his unsheathed knife in the hip pocket of his work pants is a definite safety hazard. If the floorcoverer squats down suddenly, he may receive a very severe puncture wound—an immediate injury. Because the floorcoverer did not heed warnings of the danger of carrying his knife in his pocket, this situation is an example of a worker's wanton disregard for rules and proper methods. This safety hazard is clearly caused by an unsafe act.

Keeping an unsheathed knife in your workpants is a safety hazard created by an unsafe act.

Working in a room filled with carbon monoxide is a serious health hazard caused by an unsafe condition. Symptoms include dizziness and drowsiness.

Situation Number 2, in which a floorcoverer is sent without supervision into a new work situation, a room filled with carbon monoxide, is a health hazard to this worker. Carbon monoxide cannot be detected by the senses and if the worker remains in the room, he will become sick, dizzy and confused and may lose consciousness. If he is not discovered, he may die. In this case, the unsupervised worker did not know that a hazard was present. The health hazard here results from inadequate supervision and from a carbon monoxide-filled room — both of which make a dangerously unsafe condition.

Working below an improperly secured paint bucket is a safety hazard created by both an unsafe act and an unsafe condition.

Situation Number 4, a floorcoverer cuts the ground plug off his carpet seamer, is a blatant disregard of proper rules and procedures — an unsafe act. When the carpet seamer is plugged in, a serious hazard of electrical shock exists — a safety hazard. All electrical equipment should be properly grounded or double insulated to reduce the possibility of electrical shock.

In situation Number 3, a floorcoverer passes below a painter who improperly hooked his paint bucket to his ladder. This, of course, is a safety hazard. The paint bucket on the ladder represents an unsafe act, and the floorcoverer's passing beneath without a hard hat is an unsafe act. If the floorcoverer had a hard hat, he should have worn it. If he didn't have a hard hat, he should have used another entrance to the building. This is an obvious safety hazard since the paint bucket could fall on the floorcoverer's head.

Cutting the ground plug off the carpet seamer is a safety hazard created by an unsafe act.

When a floorcoverer is required to work in a room where a drywall taper is mixing and sanding asbestos-containing spackle, as in situation Number 5, this results in a serious health hazard. Exposure to asbestos can cause asbestosis or worse. The existence of the asbestos in the room is an unsafe condition, but if the floorcoverer refused to wear a NIOSH/MSHA approved respirator for asbestos, he commits an unsafe act. However, if the floorcoverer was not supplied a NIOSH/MSHA approved respirator for asbestos, then this was an additional unsafe condition.

Removing asbestos felt with an alcohol solution . . . a health and safety hazard.

Working next to a taper mixing and sanding asbestos-containing spackle is a very serious health hazard created by an unsafe condition.

In situation Number 6, a floorcoverer removes asbestos felt with an alcohol solution in a closed room warmed by a gas heater. The unvented gas heater and the alcohol vapors pose a very unsafe condition. This unsafe condition results from both a safety and health hazard. The alcohol vapors are a safety hazard because they could be ignited by the gas heater, causing burns and other damage to the floorcoverer and workplace. The floorcoverer may become dizzy and confused through inhaling the alcohol vapors and exhaust fumes and would be more likely to make mistakes which cause accidents. The alcohol vapors and exhaust from the heater can also make the floorcoverer ill—a health hazard. The safety and health hazards in this situation, caused by an unsafe condition, are worsened by the unsafe act of the floorcoverer: he did not bother to open a window or otherwise ventilate the room to eliminate the toxic substances.

PAINT MAKERS

Following are six situations. Read each description and check whether it is a safety hazard or a health hazard or a combined safety and health hazard. After deciding what type of hazard it is, then check whether it is created by an unsafe act or by an unsafe condition or by both an unsafe act and an unsafe condition.

1. **A paint maker does not heed warnings and refuses to wear gloves while cleaning paint vats with styrene.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

2. **A new worker in a paint plant forgets to ground the container before transferring solvent.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

3. **A paint maker loading pigment powder refuses to wear a dust mask respirator.**

   This is a

   ___ **safety hazard**

   ___ **health hazard**

   ___ **combined safety and health hazard**

   This hazard is created by

   ___ **an unsafe act**

   ___ **an unsafe condition**

   ___ **an unsafe act and an unsafe condition**

4. Two paint makers feed raw materials into a grinder without a guard.

This is a

___ safety hazard

___ health hazard

___ combined safety and health hazard

This hazard is created by

___ an unsafe act

___ an unsafe condition

___ an unsafe act and an unsafe condition

5. A paint maker fails to use a dolly or lifting device to move a solvent barrel.

This is a

___ safety hazard

___ health hazard

___ combined safety and health hazard

This hazard is created by

___ an unsafe act

___ an unsafe condition

___ an unsafe act and an unsafe condition

6. A paint maker never washes before eating lunch.

This is a

___ safety hazard

___ health hazard

___ combined safety and health hazard

This hazard is created by

___ an unsafe act

___ an unsafe condition

___ an unsafe act and an unsafe condition

PAINT MAKERS

Cleaning a paint vat with stryene without wearing protective gloves such as these is a health hazard created by an unsafe act.

Situation Number 2, in which a new worker in a paint plant forgets to ground the container before transferring solvent, is a potentially disastrous safety hazard. The vapors of volatile chemicals such as solvents can be easily ignited by a spark from static buildup conducted by the metal container or by the worker himself. Any metal part anywhere in the paint plant must be properly grounded. Grounding metal parts and containers is an easy task that anyone can do and that will protect the lives of everyone in the plant.

The fact that this new worker "forgot" to ground the container may mean the worker did not receive adequate training and supervision. In any case, it is an unsafe act.

Situation Number 1, in which a paint maker does not heed warnings and refuses to wear gloves while cleaning paint vats with styrene, is a definite health hazard. If the paint maker repeatedly cleans vats with the solvent styrene without wearing gloves, the possibility that he will suffer skin irritation and even dermatitis is very strong. Styrene defats the skin, as do many solvents. In addition, styrene can be absorbed by the skin and passed into the bloodstream, where it may damage the kidneys, liver and blood.

This health hazard is clearly caused by an unsafe act. This worker can and should wear gloves to avoid this hazard.

When you pour solvents from one container to another, the containers must be electrically interconnected. Otherwise it's a safety hazard created by an unsafe condition.

In situation Number 3, a paint maker loading pigment powder refuses to wear a dust mask respirator. This is a very serious health hazard. Even if engineering controls, such as fans, are in place, much of this dust will still be inhaled by the paint maker who refuses to wear a respirator. This unsafe act is jeopardizing the life and health of this paint maker. Pigment dusts are known to cause serious and even fatal respiratory conditions such as chronic bronchitis, dust pneumoconiosis and even lung cancer.

Any foreign substances—whether dust, vapor, fumes, mists or particulates—that enter the lungs will certainly not have a *good* effect upon health. When handling pigments or any hazardous substance, you should also keep your hands and arms covered. The effects of some of these substances are known, but further research may reveal that some substances which we believe to be safe are actually hazardous to health. Until all the results are in, it's smarter and—in the long run—easier to wear the respirator and avoid any ill effects.

This unguarded bench grinder is a safety hazard created by an unsafe condition. The grinding wheel must be partially enclosed.

Refusing to wear a respirator while loading pigment is a serious health hazard created by an unsafe act.

Situation Number 4, in which two paint makers feed raw materials into a grinder without a guard, is an all too common safety hazard. Unguarded machinery represents an unsafe condition with a great potential for an accident. All moving parts — gears, pulleys, chains, flywheels and so forth — must be guarded to protect workers. If these two workers are in an area where solvent fumes are present, they are subject to solvent-intoxication and thus more likely to make mistakes in their work. But whether a worker is clear-headed and alert or under the influence of intoxicating vapors, he or she must be protected from dangerous machinery by engineering control measures such as machine guards.

Lifting barrels by hand when mechanical lifting aids are available is a safety hazard created by an unsafe act.

In situation Number 5, a paint maker fails to use a dolly or lifting device to move a solvent barrel. As we learned earlier, strains are the number one cause of injury to paint makers. With all the lifting done in paint manufacturing plants, it is absolutely essential for workers to save their backs with proper lifting techniques and mechanical lifting aids. Failure to use a dolly when moving a heavy solvent barrel is an unsafe act that can result in a severe back strain. Perhaps many workers do not understand just how easy it is to strain the back. Whether you are in fine physical condition or a little bit out of shape, you can still strain your back if you lift too much or lift improperly. Part of a paint maker's job training should include instruction in proper lifting techniques, and the paint maker should use them consistently. If all paint makers used the proper lifting techniques, strains would not be the leading cause of injury in this occupation. This is a safety hazard that can be avoided.

In situation Number 6, a paint maker never washes before eating lunch. This is clearly a health hazard created by an unsafe act. Washroom facilities are provided at all paint manufacturing plants, and everyone in the plant—no matter what his or her job—should always wash thoroughly before eating lunch, having a snack or smoking a cigarette. Hazardous substances, such as solvents, pigment dusts and paints, accumulate on your hands. Even if you know enough to wear gloves to protect your hands from irritation and dermatitis, you should remove them and wash thoroughly before lunch, coffee breaks or smoking cigarettes. Any hazardous substances on your hands will pass to your food and into your mouth if you do not always wash regularly. You may also want to apply a lotion or cream to your hands to help protect them from drying out and from the effects of solvents and other substances.

Eating without washing up is a serious health hazard created by an unsafe act.

Learn to ANALYZE your job. Good planning can prevent most accidents.

Being able to analyze your workplace is an important part of reducing accidents. Identifying safety hazards and health hazards like these and recognizing unsafe conditions in the workplace and unsafe acts committed by yourself or by co-workers give you better hope of surviving to a ripe old age and enjoying your pension as a healthy person. You can work with your employer to correct the unsafe conditions and your employer can work with you to reduce unsafe acts.

To determine the risks of your job, you must learn to identify safety and health hazards in your workplace and to uncover the unsafe acts and unsafe conditions which create them. You must also have some idea of what the effects of safety and health hazards will cost you if an unsafe act or unsafe condition causes an accident.

Nationally, occupational accidents cost about $16 billion annually, enough to employ one and one-half million people at $10,000 a year each. This does not include all occupational health costs.

But in your own workplace, you need figures that relate directly to you. A 1974 study shows that 7% of the workers interviewed lost two weeks or more due to some work-related accident during their past year of employment. Accidents caused by safety hazards usually occur in the space of one minute or less. Two weeks of lost-time is 4800 minutes, not counting overtime. So that means that each year one worker in fifteen gambles on a 4800-to-1 shot and loses. To justify such a gamble—assuming the 1-in-15 probability of a lost-time accident happening—a 10 dollar an hour worker should really be making five and one-half dollars a minute! No employer is ever going to pay you that much and so you should never take that kind of risk.

Not every accident is going to cost you two weeks of work. Some will take your life or that of a co-worker. Others will only cause minor irritation that makes your job less comfortable and your life more miserable.

Costs to you and your employer due to accidents can be very great. The average cost for each workplace accident in 1975 was $7,000.

And, of course, the harm done to you by those health hazards isn't going to show up for years.

All hazards are created by unsafe acts and unsafe conditions. And the fact remains, controlling hazards in the workplace is the responsibility of you and your employer.

Yes, your job involves some risk. But even office work is risky. Life itself is risky. And it is crazy to increase that risk unnecessarily. Don't go out on a steel beam without a safety line just because somebody left it in the construction shack; the extra twenty steps will save your life. Don't refuse to wear a respirator just because you don't like the way it feels; you'll get used to it and it's more comfortable than chronic bronchitis. Don't work without proper ventilation; an open window is better than the neurotoxic problems caused by solvent-intoxication. Have an organized tool box; not only will you save time searching for tools but you might also save a finger— or part of one.

Reduce your risks by eliminating unsafe conditions and unsafe acts wherever you can.

You have to take enough risks daily without stacking the deck against yourself. Work like a good card player plays. Make every effort to figure out everything you can about each job. Find out the odds and who's holding what cards because you are betting your life.

Basically, knowing where you stand requires that you determine six things about your workplace and your job. In order to take risks that are acceptable: first, know the demands of the job; second, determine your own capabilities and limitations—be realistic; third, determine what you gain if the task is attempted with the risk involved; fourth, determine what the bad consequences are if you fail at the task; fifth, determine what will be lost if the task is not attempted at all; and sixth, try to think of alternative courses of action with reduced risks that also allow you to accomplish the job. When you determine these six things about your job then you are ready to apply the four basic methods of control in your workplace to eliminate unsafe conditions and unsafe acts.

Control Strategies

Controlling hazards in the workplace so that workers can do their jobs with minimum threat to their physical well-being involves one or more of four possible control alternatives.

Before starting a job, make sure you are holding all the right cards because you may be betting your life.

Toxic solvent vapors are present in a workplace. These workers have no protection against breathing them. If the workers' exposures are not controlled, they have a high probability of developing one or more occupational illnesses. Here are how the four control methods could be used to protect the workers.

Alternative 1. Substitution

Remove the hazardous agent by substituting a non-hazardous or less hazardous substance, if one is available. If practical, the possibility of worker exposure to a health hazard is eliminated or at least reduced to acceptable levels.

Alternative 2. Engineering Control

Intercept the hazard by engineering control. For example, erect a barrier between the worker and the hazard. Other examples of engineering controls are machine guards, automated processes, sound absorb-

ing panels or, for the workers exposed to the toxic vapors, local exhaust systems which prevent toxic vapor from entering the worker's breathing zone.

Alternative 3. Administrative Procedures

In situations where the worker cannot be permanently removed from the hazardous situation, he or she can be rotated among jobs or given rest periods to reduce "total" daily exposure to safe levels. These are examples of the third alternative, administrative controls.

Alternative 4. Personal Protective Equipment

Use Personal Protective Equipment. This alternative is the employer's most popular choice of hazard control, even though its use is limited. The many problems with personal protective equipment arise from improper selection, use and maintenance. The most important protective equipment is that if the protective device fails for any reason, *the worker is subjected to the full destructive effect of the hazard.* Personal protective equipment should be chosen only as a last resort: used when substitutes are not available, when engineering the hazard out of the workplace is impractical, or as an interim measure while more effective controls are being provided.

You and your employer are responsible for preventing those unplanned interruptions in workplace activities that cause personal injury, death and property damage known as accidents.

To do so, you and your employer must learn to assess the unsafe acts and unsafe conditions in your workplace and correct them before they cause workplace accidents.

FALLS—THE NUMBER ONE ACCIDENT

Everybody falls—you fall, I fall, he falls, she falls—we all can fall. We are all subject to the laws of gravity—what goes up must come down. Falls on the same level usually don't result in serious injuries. But falls from one level to another cripple and kill. The farther the fall, the greater the injury.

Most of the work a painter or allied tradesworker does is out of reach. Ladders and scaffolds extend that reach.

Falls off ladders and scaffolds—accidents—are caused by unsafe acts or unsafe conditions or some combination of both. Unsafe acts and unsafe conditions show the need for regular examinations for workers and rigid inspections of work environments and equipment.

Property erected ladders and scaffolds will prevent falls that can kill or maim.

Regular physical examinations for workers help determine ability to work at heights. And, of course, training in the construction and use of ladders and scaffolds must always be given.

Examine the workplace for potential hazards, such as electrical power lines or holes in floors where rolling scaffolds are used.

Inspect equipment such as scaffold members, ladders, ropes and cables before, during and after each use. Repair or replace defective materials and equipment.

Ladders

Unsafe ladders and unsafe acts on ladders cause many serious injuries and deaths. Avoid accidents on unsafe ladders and unsafe acts on ladders by following these guidelines.

Store all ladders in a well-ventilated area away from damp places, heaters, radiators and steampipes. Support a stored ladder along its entire length to prevent sagging and warping.

Inspect all ladders periodically. The joints between the steps and siderails must be tight and all hardware must be secure. Check the non-slip safety shoes. Are they securely attached to the siderails? Any

movable parts should operate without binding or excessive play.

No ladders, especially wooden ones, should be painted. Paint hides dangerous cracks and defects. Instead, apply a clear finish of linseed oil to prevent weather damage.

Tag all damaged ladders with "Dangerous, Do Not Use." Then either have the damaged ladder repaired or replace it.

Sound footing is absolutely necessary for all ladders. Boxes, barrels and blocks are not sound footing. Brace the feet of the ladder or stake them to prevent slipping. And don't place a ladder in front of a door or passage without locking the door or barricading the passage.

Always fully open a stepladder. The spreader on a stepladder locks in place when the ladder is fully opened. Even though OSHA permits rope spreaders on painters' ladders, common sense calls for a locking metal spreader. Don't climb higher than the second step from the top nor up the back section of a stepladder. The back section is not designed to support you. And don't forget to check the braces to see if they are in good shape.

Set a rung ladder's feet one-fourth of the ladder's height from its resting point. For example, set the base of a ladder supported at a 20-foot height five feet from the wall. The support rests against a flat, firm surface. And don't forget to check the strength of the top support. If you are going to climb off the ladder onto the roof or platform, the ladder must extend at least three feet above the point of support and it must be tied-off.

Keep steps and siderails free of grease, oil and mud. Also, clean all mud off your shoes before climbing the ladder. Steps, especially metal ones, need to be rough to prevent slipping.

The upper section of an extension ladder rests on the lower section. Never adjust an extension ladder while you or anyone else is on it. Climb down first. Then adjust.

Five feet of overlap is the minimum required if the ladder is extended 48 to 60 feet. Four feet of overlap is the minimum for 36 to 48 feet lengths. And three feet of overlap is the minimum for an extension ladder under 36 feet. Extension ladders over 60 feet cannot be used.

By the way, never but never splice short sections of ladders to make a longer ladder. Get a longer ladder or scaffold. And don't use ladders made by fastening cleats across a single post or pole.

Tools or equipment left on a ladder mean trouble for those below. Protect your co-workers.

If you ever become panicky, dizzy or ill on a ladder, do not try to climb down hurriedly; drape your arms around the rungs, rest your head against

the ladder, call for help and wait until you feel better.

Inspect your ladder daily. Tag defective equipment for repair or replacement. And notify your supervisor of all defective equipment.

Scaffolds

Falls from scaffolds injure and kill too many painters and allied tradesworkers. Falls from scaffolds are avoided by eliminating unsafe acts and unsafe conditions.

Inspect scaffolding before erection. Concentrate on four main areas: rust, straightness of members, integrity of welds and condition of wood.

Rusted parts, bent members, damaged welds and cracked or split wood are all structural weaknesses. The strength of a structurally weakened part is unknown. Don't find it out the hard way. Replace damaged and weakened scaffolding.

Erect the scaffold according to the manufacturer's directions. A rigging expert supervises the erection process to see that no damaged or deteriorated equipment is used. And it's up to you to point out all defects.

Use adjusting screws instead of blocks to compensate for uneven grade conditions, or, if necessary, build the ground up.

A good solid foundation for any scaffold is an absolute must. Consider the scaffold load, type of soil and weather conditions before the scaffold is erected. Mud sills are used to distribute the scaffold load over a suitable ground area.

Plumb and level all scaffold members as the erection proceeds. Don't guess. Use a plumb bob or carpenter's level. Fasten or nail all braces securely. Braces should not be forced to fit. Level the scaffold until proper fit is easily made.

Tie wall scaffolds into the structure at least every 25 feet of height and length. Free standing scaffolds are protected against tipping by guying, outriggers or other means. Partially or fully enclosed scaffolds increase wind resistance, so use extra tie-ins.

Only "scaffold" grade plank is used. Don't forget to check it for cracks or splits. The planks are supported by bearers at least every 6 feet. The width of two planks is the minimum required for platforms. Planking must be overlapped by at least 12 inches and extend beyond the center of the support by at least six inches. Support overlapped planking from underneath unless you want a quick and unexpected trip to the ground. Planking should be cleated at both ends to prevent slippage. When the planking is not cleated, it extends over the end supports by at least 6 inches but not more than 18 inches. Don't walk out on unsupported ends of the planking.

Avoid gaps between scaffold planks. Gaps permit tools, materials and workers to fall—onto something or someone.

Guardrails, midrails and toeboards are required on scaffolds over 10 feet. The guardrail must support your weight without bending or giving. In addition, when people may be below the scaffold, install a wire mesh screen between the toeboard and the guardrail. Don't forget a ladder for access. Never climb up the braces.

Keep all scaffold parts, especially the platforms, free of snow, ice, oil, grease and other slippery substances. If necessary, sand down the wooden surfaces to remove the substances.

Wood Scaffolds

Wood scaffolds require the supervision of an expert during erection.

No nail smaller than an 8-penny is used in the construction of wood scaffolds. Drive the nails all the way in at angles.

Brace wood scaffolds horizontally and diagonally. If the wood scaffold is independent, cross bracing between the inner and outer legs is required.

Steel Scaffolds

Steel scaffolds are not used near electrical lines unless the power company has de-energized the lines.

Use adjusting screws to level the scaffold members — not blocks and boxes. All panels must have secure coupling pins to prevent dislodging. And don't forget to check for rust, bends and damaged welds. Horizontal and longitudinal bracing is a must. Follow the manufacturer's recommendations.

Mobile Scaffolds

The casters on rolling scaffolds must be big enough for the height of the tower, the load to be applied to the tower and the surface over which the tower is to be used. The larger the scaffold, the larger the casters.

Don't extend adjusting screws more than 12 inches on any rolling scaffold.

Near the bottom and at 20-foot intervals, install horizontal braces. And don't forget cross braces on both sides. The platform height must not exceed four times the smallest base dimension unless otherwise stabilized. Install ladders for easy access.

When moving the rolling scaffold, remove all tools and equipment—and workers. The floor should be level and free of obstruction. When the scaffold is in use, *lock* the casters into position.

Two-Point Suspension Scaffolds

Erect the swing stage under the *direct* supervision of an experienced rigger. The roof irons, hooks and other supporting hardware must be made of mild steel. Reinforcing bars are forbidden. Properly weight and ballast the booms at their back ends and tie them back to a substantial member of the build-

ing. Tie-backs of three-quarter inch Manila rope, or equivalent, must serve as secondary means of anchorage.

Install tie-backs at right angles to the face of the building and secure to a structurally sound portion of the building.

All hooks must be closed or "moused" and provided with rings for tying back. Two thousand pounds is the minimum the hooks must be able to support.

Before the swing stage is put into use, lower it to within 12 inches of the ground and test it by weighting the scaffold with six times the rated load.

No more than two workers can occupy a swing stage unless it is specifically rated for three workers or 750 pounds working load.

What else do you need on a swing stage? How about personal protective equipment. You must have a safety belt attached to a lifeline. The lifeline must be made of three-quarter inch Manila (or equivalent) and attached to a structurally sound portion of the building. The scaffold or any part of the scaffold is *not* a structurally sound portion of the building. If any part of the scaffold fails, you will still be saved *if* you have a safety belt attached to a lifeline — and if both are in good condition.

Bosun's Chair

No worker should use a bosun's chair who is not competent to operate it. In addition, the worker in the chair is attended by another worker at all times.

One inch by 24 inches by 12 inches are the minimum dimensions for the hardwood seat.

The ropes supporting the seat are five-eighths inch in diameter, threaded through the four seat holes and crossing each other under the seat. Also, install a rope guard at the front and rear of the chair 18 inches above the seat. A rope tackle with at least one single and one double block equipped with an approved safety hook and mousing device are used to raise and lower the chair. Five-eighths inch Manila or cable or equivalent strength is the minimum size acceptable.

Tie the chair into the building to prevent swaying during working operations. And don't forget your safety belt and lifeline. The safety belt must be equipped with an approved locking device or "grab." The lifeline is then securely attached to the roof, separate from the rest of the scaffold, and reaches to the ground. A final check of any scaffold should always be made before using it.

Final Check

Check the supporting members to make sure they are in firm contact with each other and the ground. Check the ground beneath base plates and mud sills for washouts. Check for plumbness and make

sure that each tier is firmly attached to the next. All braces must be secure and free from rust, cracks and splits. Planking should be secure, properly supported and there should be no gaps. Ropes and cables must be in top condition—free of frays and other signs of wear.

Recheck the scaffold daily, even while you work. You will soon learn to be sensitive to changes in the "feel" of the scaffold. Trust your intuition.

Rope

Rope has been called the "painter's best friend." But there is a qualification to this statement. Rope provides strong, safe service if it is used within limitations and is not mistreated. Otherwise, it can be as lethal as a hangman's noose.

Rope should be stored in dry, well-ventilated areas—preferably coiled and hanging on wood planks or platforms slatted for air circulation. The rope should be stored away from extreme heat, cold, dryness and humidity. Damp rope rots and dry rope becomes brittle, losing much of its strength and durability.

The rope should be kept clean and protected from acids, alkalis and solvents. A dirty rope is washed with clean water and thoroughly dried.

Knots and kinks must be avoided. And when usage requires that a rope be continually twisted in one direction, compensating turns should be made to avoid damage to the rope structure. Repeated wear in one direction will shear the fibers and weaken the rope.

A safety factor of five is recommended for all ropes. The safety factor is the ratio between minimum breaking load and the working load. For example, if the minimum breaking load of a rope is 2500 pounds, then a safety factor of five requires that the rope never be loaded with more than 500 pounds.

Should a rope become damaged, cut and splice it. A good splice restores about 90 percent of the strength of the rope, but make sure to check the rest of the rope for damage; if a rope is damaged in one spot it may be damaged in another.

To check the rope, twist it so that the strands spread apart. If there is a powdery appearance or broken strands, the rope is damaged and should be discarded. Also, sand or grit on the inside of the rope will destroy the inner fibers, but unless you check, you won't find out until it's too late.

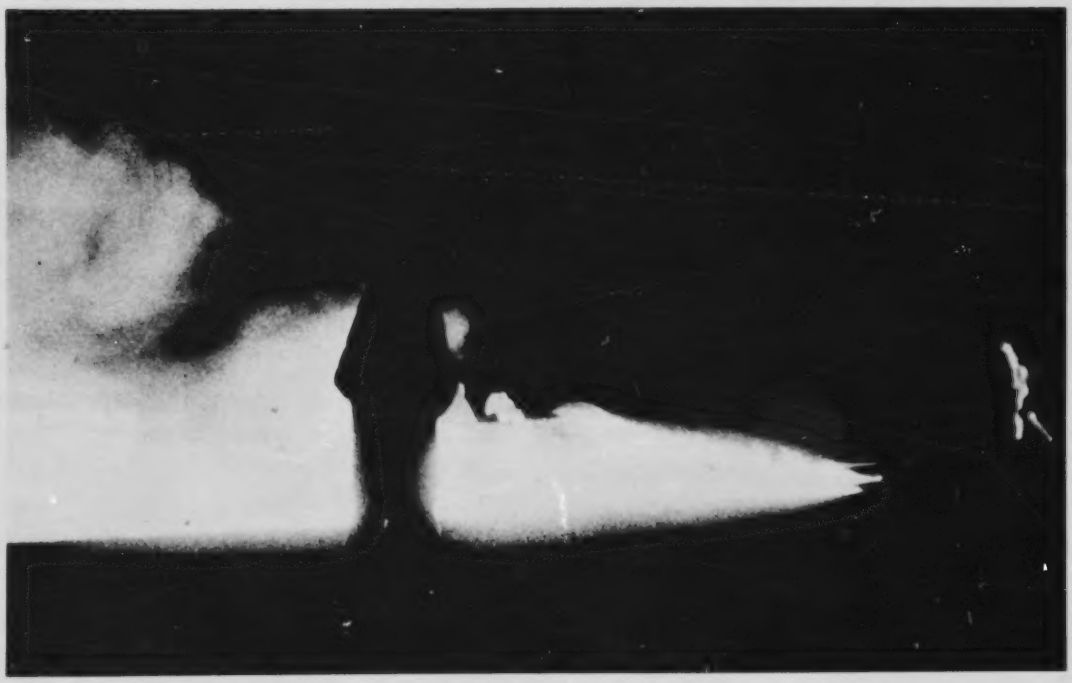
FIRES AND EXPLOSIONS

The hazards of fire and explosion are continuous dangers for painters and allied tradesworkers. The skilled worker knows and understands fire hazards and how to control them.

Good housekeeping is crucial to prevention of fires. Organize materials and store them correctly. Dispose of oily rags in covered metal containers. And, of course, smoking is allowed only in totally safe designated areas.

Most solvents are flammable. In confined places, such as tanks and closed rooms, solvent vapors build up into explosive mixtures. Do you know what elements must be present to create a fire or explosion? Below are several possible answers. Choose the ones you think are correct.

Fires and explosions have killed thousands of workers. Know how fires and explosions are caused.



Do you know what "elements" must be present to create a fire or explosion? Below are several possible answers. Choose the ones you think are correct.

___ 1. **Oxygen**

___ 2. **Paper or wood**

___ 3. **A flame**

___ 4. **Fuel**

___ 5. **O_2**

___ 6. **Source of ignition**

___ 7. **Flammable vapors or liquids**

___ 8. **A spark**

One thing needed for a fire or explosion is a source of ignition, Number 6. Number 3, a flame, and Number 8, a spark, are sources of ignition, so they are also correct. Without a source of ignition, there is nothing to start a fire or cause an explosion. But, a source of ignition isn't enough. You also need Number 4, fuel, and Number 1, oxygen. Number 2, paper or wood, and Number 7, flammable vapors or liquids, are fuels. Number 5, O_2, is the chemical formula for oxygen. All of the answers are correct, but the three best answers are: source of ignition, Number 6, fuel, Number 4, and oxygen, Number 1.

Fires and explosions are prevented by keeping at least one of these three elements—source of ignition, fuel or oxygen—out of the workplace. Obviously you don't want to keep oxygen out of the workplace. So you must keep ignition sources and fuel out of the workplace.

Non-sparking equipment, including safety shoes and explosion-proof motors and lights, are used in environments where explosions can happen, such as tanks, paint mixers and vats.

Where static electricity may build up, hoses and airlines are coated with carbon black to dissipate the static electricity without a spark. Ground all tools and metal parts that could spark for that added protection you can count on.

Vapors of flammable and combustible substances, such as solvents, are kept below the lower explosive limit by ventilation. The lower explosive limit is the lowest concentration at which vapors can explode. Generally, when solvent vapors reach a concentration of one percent or 10,000 parts per million, an explosion may occur. Some solvents, such as mineral spirits and turpentine, cause explosions at concentrations below one percent.

A maximum solvent vapor concentration is known as the upper explosive limit. When the upper explosive limit is exceeded, the solvent vapors displace enough oxygen to prevent fire or explosion. Remember, oxygen is also needed for a fire or explosion.

In the back of this manual is a list of solvents and their lower and upper explosive limits. Check explosive vapors quickly and easily with a combustible gas indicator. Perform this test before you enter a tank or confined environment. And, perform the test at regular intervals while you are in the tank.

How can you control the hazard of flammable solvent vapors? Substitution is the first means of control. Use paint with a high solid content. The more solids, the less flammable solvents. Paints with high solid content also have a lower cost of application per square foot—something that will appeal to your employer.

If a substitution isn't made, then use ventilation. The ventilation system is designed by an

expert to reach all parts of your worksite. Placing a fan or blower in the opening of a tank doesn't work because only the air directly around the fan or blower will be circulated.

Since solvent vapors are heavier than air, they stay at the bottom of the tank. So the inlet for the new fresh air is located near the top of the tank. The exhaust outlet for the ventilation system is located near the bottom of the tank. The air flows from top to bottom and out. The exhaust fan is non-sparking with an explosion-proof motor. All electrical equipment, including lights, is explosion-proof and properly grounded to eliminate any source of ignition. And make sure to ground your spray paint equipment, especially airless spray guns. You don't need to blow yourself up.

If a fire does start, it needn't be a disaster. Fire extinguishers *do* work, and they are always available at all worksites. Management inspects extinguishers monthly to make sure they are fully charged and located on normal paths of travel. Extinguishers must be easy to see and reach.

Every year, fire extinguishers are inspected, recharged and repaired by an authorized individual.

There are different types of fires, and the available extinguisher is appropriate for the fire hazard in a particular area. For example, Class B extinguishers are effective against fires started with flammable and combustible liquids like solvents.

The maximum travel distance to any extinguisher for a Class B fire is no more than 50 feet. So know where your extinguishers are and be prepared to use them.

If a fire gets out of control and an extinguisher is no longer effective against it, there are still other measures that can save lives and minimize damage. Every permanent worksite has an adequate fire alarm system to warn *everyone* to evacuate the premises.

Periodic fire drills are staged to keep you and your co-workers familiar with the best routes of evacuation.

Many permanent worksites have fail-safe mechanisms on the overhead doors of elevators and warehouses or shops which melt immediately and release the doors to contain a fire. Of course, you never want to take an elevator during a fire. Once in the elevator, you may never come out. Take the stairs to the nearest exit.

All exits are clearly marked. And so are the pathways leading to an exit. These pathways *always* remain clear. There is no excuse for blocking them or for locking a fire door. It's asking for tragedy.

These pathways are illuminated at night if the building is occupied.

Any door that might be mistaken for an exit can waste

critical time for a worker trying to escape a fire. So these doors are clearly marked, "Not an Exit," or with a large sign telling their true function, such as "Storage Room."

Playing with fire is not part of your job as painters and allied tradesworkers. Know how to prevent fires and explosions and how to handle or escape them. Lives depend on it.

COMPRESSED AIR

Compressed air is useful on the jobsite. It is used for cleaning. It is used for spray painting. It is used for abrasive blasting. But, compressed air can also be very dangerous. Equipment containing compressed air must be handled with extreme caution. Here's how:

Never overload the compressor.

Place the compressor on an open and level area. Since it is an air compressor, it requires a good supply of clean, fresh air in order to operate. Ground the compressor before you start it up.

Give the compressor a reasonable warm-up time before building up pressure in the receiving tank.

Never tamper with preset safety valves.

It's a real good idea to keep your operating manual at the jobsite and refer to it whenever you need to.

The operating manual will tell you how to keep the compressor clean, how to keep the cooling fans, radiators, and filters from getting clogged up and who to contact for service.

The compressor gauges aren't much use if they're covered with dirt. You need to see the gauges to tell whether all air pressure has been released before you disconnect any coupling or open any lids. Keep the gauges cleaned off.

Air compressors are necessary equipment on many jobsites, but they must be used within their limitations.

All moving or rotating parts on the compressor are enclosed to keep your hands safe. The manifold and exhaust get very hot and should be avoided. Don't add fuel when the compressor is hot or running. The fuel can easily ignite, causing a fire or explosion. Don't forget to keep the compressor tuned and out of confined places.

Keep the air regulator in good operating condition. A malfunctioning regulator can over-pressurize the tank and cause an explosion. Don't work on the regulator yourself—have maintenance fix it or replace it.

The pressure tank must be in excellent condition. Pressure tanks are often pressurized up to 100 pounds per square inch. But if the tank is defective, 100 psi could blow it and you to pieces.

Overloaded compressors can blow you and your co-workers to pieces. Never overload.

Following are 10 statements about compressed air. Check the ones you think are true.

COMPRESSED AIR:

___ 1. **Cannot be used for cleaning unless the pressure is reduced to 30 psi.**

___ 2. **Is flammable.**

___ 3. **Tanks must be built to strict standards.**

___ 4. **Tanks must have a safety valve.**

___ 5. **Eliminates the hazards of exposure to lead chromates.**

___ 6. **Never explodes.**

___ 7. **Tanks must not have a valve between the tank and the safety valve.**

___ 8. **Tanks must have a drain to remove water and oil.**

___ 9. **Should be administered to a solvent-intoxicated worker.**

___10. **Tanks must have a pressure gauge.**

Compressed air tanks must be built according to strict standards so you should have checked Number 3. The standards are set by the American Society of Mechanical Engineers (ASME). This critical information is stamped on the tank. A poorly constructed or over-pressurized tank can explode, sending metal through walls and workers. The tank should be able to sustain a pressure one and a half times the maximum rated working load. Check the tank for rust and defects—it could save your life or the life of a co-worker. Number 4 is also true. The tank must have a safety valve. The safety valve releases air if the tank is overpressurized by 10 percent or more. The safety valve should be periodically checked—if it doesn't work, don't use the tank.

You should also have checked Number 7. No valves should be between the tank and the safety valve. If a valve is located between the tank and safety valve and it is closed, the safety valve is useless.

All tanks must contain a pressure gauge. So you should have checked Number 10. There is a maximum pressure the tank can hold. The pressure gauge lets you know how much air pressure is in the tank. Keep the gauge clean and if it is defective have it replaced, but first depressurize the tank.

All tanks have a drain valve, Number 8, to remove the accumulation of oil and water. Periodically open the drain valve and clean the tank out.

Finally, Number 1 is true. Compressed air is never used for cleaning unless the air pressure is reduced to 30 psi. When you use compressed air for cleaning, wear safety goggles and other protective equipment to guard against flying chips and particles.

When removing or opening the lid to the air receiver, make sure the tank is depressurized. The air pressure gauge will tell if the tank is pressurized or not, so keep the gauge working properly. Also, before starting the compressor, check the lid to see if it is securely fastened.

How are the air hoses? Are they cracked and cut? If so, the hose may burst, whipping you or a co-worker severely. Make sure the couplings are in good shape and securely fastened to the hose. Threaded couplings should be screwed on tight. Check to see that the quick-detachable coupling is properly coupled. Also, before disconnecting hoses, depressurize the tank and turn off the air compressor.

Compressed air serves many useful purposes in the paint and allied trades. Remember that it can be very dangerous. Before you use compressed air, make sure you know how to handle it, how to maintain all the equipment and what personal protective equipment you need.

Strains are the most common injuries to all workers including Paint Makers . . .

. . . Floorcoverers . . .

STRAINS

The most common injuries to all workers are strains. Strains usually happen while lifting. There's a job to do, and it's easy to kid yourself into believing that you can get away with overexerting every once in a while.

Each time you do get away with it, you feel less concerned about doing it again. You're just asking for trouble. As anyone who has experienced a serious strain will tell you: they happen in an instant and they hurt like the dickens.

Once you've strained your back, you'll find that it's a very

. . . and Painters.

tricky condition. Oh sure, you don't usually *die* of a strain—at least not right away. But sometimes you might wish you would die. And it's not something that you simply take a pill for either. It can be a disabling and long-term problem, one that will make you very sorry you didn't ask for help with that too-heavy load.

How Not To Strain

Know your limit.

You know how much you can safely handle. You're not proving a thing by taking on more. Professional weight lifters don't do it—so why should you?

Realize that you—like everyone else on this earth—are getting older all the time, and the amount you can safely lift is probably getting smaller.

No matter how much or how little you lift, there is a wrong way and a right way to do it.

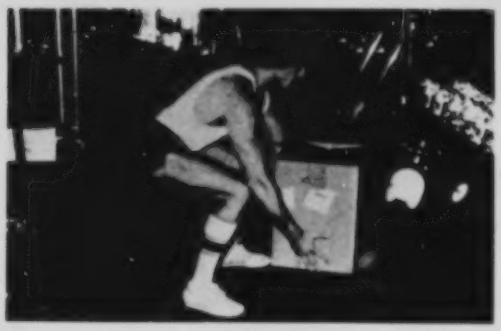
Firmly plant your feet close to the load.

Bend your knees, keeping your back straight.

Hold the center of the load between your waist and shoul-

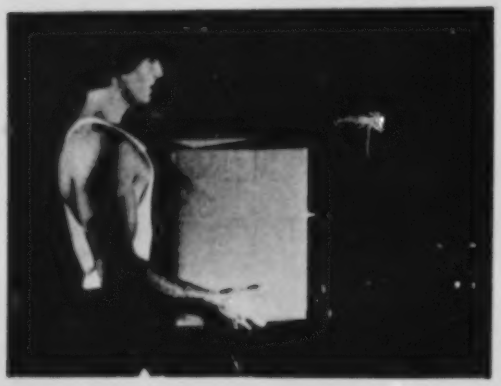
ders, keeping your back straight.

Lift with your leg and shoulder muscles—keeping your back straight—and keep the weight as close to your body as possible.



When lifting, keep your back straight and bend at the knees, get a good grip . . .

Avoid turning your body at the waist. This is extremely important no matter how small the load you lift. Turn your entire body instead. Or better yet, position yourself so that you don't have to turn at all.



and hold the load close to your body between your waist and your shoulders.

Think of your body as a priceless machine. It can lift properly only within a limited set of grooves. Movement outside of the right grooves creates tension—and strain. And can also cause a breakdown.

If the load is too heavy or cumbersome for one person to lift, get help.

Ask another person to lift it with you.

Or use a mechanical device or a carrying aid such as a strap or dollie.

Why *not* bother?

When materials are loaded at warehouses, forklifts with standard attachments are usually used to eliminate manual lifting. This is done with good reason: to save the backs of the warehouse personnel.

When that material is unloaded at the jobsite, it weighs just as much as it did back at the warehouse and it should be treated with similar respect.

Don't try to lift it alone.

Two workers lifting properly should be able to handle it without strain.

If you must unload alone, use a mechanical device or a dollie or even straps, if they're any help.

But don't take on a greater load than you can safely handle. The chances are very good that the *load* will handle *you* instead.

It's often possible to break large quantities of material into smaller-sized lots that are easier to handle.

It may mean a little extra time. But that's nothing compared to the pain you'll save yourself.

On a big jobsite, there will always be someone around to help you.

When you're doing a smaller job alone—in a private home, for example—you do not suddenly have the strength of two workers. It does no good to pretend that you do. The same rules of physics still apply. Use a device or dollie for unloading the goods.

Follow these simple tips and save yourself a lot of pain. It can make the difference between a healthy retirement at a proper age and an early disability pension. Remember your back. It's the only one you've got.

The best way to lift is to use a mechanical lifting device—you'll save yourself a pain in the back.

YOUR RIGHTS AND RESPONSIBILITIES

So you think your work environment is hazardous. And you want action. The OSH Act guarantees you a safe and healthful workplace. And you're going to walk out tomorrow and demand it, right? Or maybe you feel like you're on the other side of the coin: total inaction. You've been hearing about all these hazards, complaint forms, inspections, TLV's, variances, medical exams, discrimination problems—you name it. Even if you knew how to unlock this maze of government regulations, you wouldn't — because you might lose your job. So why bother?

Like all things, there is a right way and a wrong way to go about getting what you want. If you go running out filing complaints, you will only end up creating lots of trouble for yourself, your union and your employer. Likewise, if you sit back and do nothing you may end up needlessly injuring or killing yourself and others.

But there is a reasonable procedure you can follow to assure a safe and healthful workplace that will help you and your employer improve conditions while keeping your job secure and your employer's profits intact.

You have certain rights under the OSH Act. The most important of these by far is the guarantee of a safe and healthful workplace. If you're working in a situation you feel is unusually dangerous, such as on an unsafe scaffold or with a product containing a harmful substance like asbestos, then you should want to take advantage of your OSHA rights to eliminate the danger. Here's how to do it.

First, if you belong to a union, sixty percent or more of the battle is already won. Through your union you can probably assure yourself the safe and healthful work environment guaranteed by OSHA without ever filing an OSHA complaint. And if you have to file a complaint with OSHA, your union representative can help you contact OSHA and get the workplace hazards corrected. Most union representatives are familiar with OSHA administrative procedures. Here is IBPAT's step-by-step procedure for guaranteeing your protection.

Step 1. If the craftsman can abate the hazard, he or she should do so. This may include referring the problem to the foreman if appropriate. *If the situation is not corrected:*

Step 2. Bring the hazard to the attention of the Steward. The Steward should try to correct the problem by working with the job supervisor. *If the problem is not corrected:*

Step 3. The Steward should inform the Business Agent. The Business Agent should try to resolve the issue with the Project Management. Failing this, the Business Agent should inform the Business Manager. *If the situation is not corrected:*

Step 4. The Business Manager, depending upon the nature and imminency of the hazard, should bring the matter to the local Building Trades Council. The Council should meet with the Project Management to resolve the situation. *If the situation is not corrected:*

Step 5. With the recommendation of the Building and Construction Trades Council and the local union, a formal OSHA complaint should be filed. *If the problem is not corrected:*

Step 6. The Building and Construction Trades Council and IBPAT should be asked to bring the matter before the Secretary of Labor through the appropriate channels.

When you reach Step 5, or if you have no union affiliation, you might consider asking for a NIOSH Health Hazard Evaluation before filing an OSHA complaint. The NIOSH Health Hazard Evaluation can be used to determine the extent of a workplace health hazard. The NIOSH Health Hazard Evaluation differs from an OSHA inspection in five significant ways.

NIOSH HEALTH HAZARD EVALUATION

First, a NIOSH Health Hazard Evaluation does not cover safety hazards.

Second, the NIOSH representative has no authority to require an employer to correct a hazardous condition. If a hazard is found and your employer refuses to correct the hazard voluntarily, OSHA must be called in to enforce compliance.

Third, in most circumstances the NIOSH representative gives the employer advance notice of the evaluation unless the NIOSH representative determines that advance notice will adversely affect the results of the evaluation.

Fourth, the right of your representative to accompany the NIOSH representative is more limited during a Health Hazard Evaluation than during an OSHA inspection. Your representative will have the opportunity to accompany the NIOSH representative only if the Health Hazard Evaluation is requested by an employee or employee representative.

Fifth, the evaluation will be confined strictly to the items listed in your "Request for

133

Health Hazard Evaluation." It will not include a general workplace inspection.

The easiest way to obtain a Health Hazard Evaluation is to write to the NIOSH representative at any Department of Health, Education and Welfare regional office and ask for a form entitled "Request for Health Hazard Evaluation." A list of the HEW regional offices and addresses is included in the back of this manual. A union representative can help you decide whether a NIOSH Health Hazard Evaluation is needed.

OSHA COMPLAINT

Your strongest course of action is the OSHA complaint. If it becomes necessary to file an OSHA complaint to correct a workplace hazard, here are a few facts about the process that will make the task less overwhelming.

First, even when no specific OSHA standard covers the hazard, your employer may still be cited by OSHA under its "general duty" clause, which requires every employer to provide safe and healthful working conditions. So don't be dissuaded from filing an OSHA complaint by someone who says you have no grounds for a complaint just because you can't cite a specific OSHA regulation. If the work conditions aren't safe and healthful, you've got the basis. In the OSHA complaint, state as best you can the hazardous condition, the danger it presents and the name and the address of your employer. OSHA has developed a form for filing this complaint. A sample is in the back of this manual.

Second, the OSHA complaint must be signed by someone: you, your union representative, your lawyer or a member of your family. If you sign a complaint, you can request that your name be withheld from your employer. In this way, your job cannot be threatened. Besides, if your employer should discharge or discipline you for filing an OSHA complaint, you can file a discrimination complaint against your employer.

After your OSHA complaint is filed, OSHA will evaluate it to determine if an inspection is warranted. If OSHA decides not to inspect but you still think your workplace is hazardous, then you can appeal to the Regional Administrator of OSHA. If OSHA decides to inspect, your representative will have the right to walk around with the OSHA inspector, to point out hazards and to aid the inspection in other ways. Your representative should make sure that all areas of the workplace are covered during the inspection. Finally, at the end of the inspection your representative should request a closing conference with the OSHA inspector. During the closing conference your representative will discuss all issues and bring up all questions relating to the inspection.

You, as an employee, have the right to notify the OSHA Compliance Officer, in writing,

of any hazard that exists in your workplace. In addition, the OSHA Compliance Officer may wish to interview employees during an inspection so that the OSHA Compliance Officer may conduct a thorough and proper inspection.

After the inspection, you or your representative may request an informal conference with the Regional Administrator. An informal conference is requested if you believe some aspect of the inspection was inappropriate or a question exists regarding the citation, proposed penalty or abatement period issued to the employer. An informal conference is only held at the Regional Administrator's discretion.

If an informal conference is held, your employer may be invited to present views and opinions. Similarly, if an informal conference is held at your employer's request, you or your representative may also be invited to present your views. Any settlement reached at an informal conference must meet only one requirement: it must be consistent with the purposes of the OSH Act.

If OSHA issues your employer a citation after an inspection, a copy of the citation must be posted immediately for the affected employees. If the inspection occurred because of your complaint, you will also receive a copy of the citation. The citation will help you decide whether to contest the abatement or correction period.

After OSHA has cited your employer for violation of any safety and health standards, your employer may contest any item on the citation, including the violations, the proposed penalty and the length of the abatement period. An employer's contest of the citation or abatement period postpones the required abatement period set in the citation. You, as an employee or employee representative, have the right to contest only the period set for abatement. However, an employee's contest of the abatement period does not postpone the requirement that the employer abate the hazard within the period set in the citation. You cannot contest the cited violations or the amount of the proposed penalty.

If you decide to contest the abatement period, file a written notice with the OSHA Area Director within 15 working days from your employer's receipt of the citation. Give a written copy of your notice of contest to your employer. An administrative law judge will then be assigned to hear your case and render a decision. If the decision is not favorable, you can appeal to the Occupational Safety and Health Review Commission. If the Review Commission's decision is unsatisfactory, you can then appeal to the Federal Appeals Court.

If your employer contests the citation, the proposed penalty or the abatement period, you may become a party in the hearing by filing a "Statement

141

of Intent to Participate" or a "Statement of Position" with the Occupational Safety and Health Review Commission.

Your party status in the hearing entitles you to several privileges. You can file briefs; you can bring your own witnesses and cross-examine the other party's witnesses; you will receive notice that the transcript is available; you can object to the conduct of the hearing; and you can receive a copy of the judge's decision.

Similarly, if you contest the abatement period, your employer may file for party status.

A hazard in your workplace that may cause death or very serious harm at any time poses an "imminent danger." There are three courses of action you can follow to protect yourself when an *imminent* danger exists.

The first course of action is to inform your employer and request that the hazard be abated immediately.

Should your employer refuse to abate the hazard, then you should file a complaint with OSHA *and make it clear* that the hazard is an imminent danger. An imminent danger complaint can be filed over the phone, but you should follow it up with a written complaint. Imminent danger complaints receive top priority. If OSHA decides your complaint is valid, an inspection will follow within 24 hours.

If your employer does not abate the hazard and if OSHA does not follow-up your complaint with an inspection, then your final alternative is to refuse to work under the imminent danger provision of the Act. Refusal of work is a very extreme action and should be used as a last resort only under the most serious circumstances.

The National Labor Relations Act (NRLA), Section 502 states, ". . . nor shall the quitting of labor by an employee because of abnormally dangerous conditions for work at the place of employment of such employee or employees be deemed a strike under this Act." In other words, an employer cannot legally take disciplinary action against you if you refuse to perform work under "abnormally dangerous conditions."

Remember: the NLRA emphasizes, "abnormally dangerous conditions." Almost all jobs have some inherent danger. A refusal to work under normal conditions is not usually protected under the NLRA. Refusal of work should not be taken lightly and should be exercised only under the most hazardous of conditions. Finally, you should realize that if you do refuse to work under hazardous conditions, the final decision in your case may be reached by a judge who may not be looking at the situation from your point of view.

OSHA has also published regulations protecting workers who refuse extremely dangerous work. However, these regu-

lations have not yet been fully tested in the courts.

DISCRIMINATION COMPLAINT

A very important right under the OSH Act is your right to protection from discrimination for exercising your rights. The mere fact that you have rights is no good unless discrimination against you for using those rights is prohibited.

Section 11(c) of the Occupational Safety and Health Act of 1970 provides that "No person shall discharge or in any manner discriminate against any employee because such employee has filed any complaint or instituted or caused to be instituted any proceeding under or related to this Act. . . ." If you are discriminated against for exercising your rights, file a discrimination complaint within 30 days after you were discriminated against or discovered you were discriminated against. Exceptions may be made for extenuating circumstances; however, the complaint must be filed as soon as you are aware of the discriminatory action.

The discrimination complaint should be written, although an oral complaint is acceptable. The complaint should contain your name, address and phone number, the date of the discriminatory action, the nature of the action (such as discharge, suspension or demotion), witnesses and any other information that could possibly be useful. File the discrimination complaint with the OSHA office nearest you.

OSHA will evaluate your complaint. If it is valid, an OSHA representative will try to reach a voluntary settlement with your employer. If an acceptable settlement cannot be reached with your employer, OSHA will take your case to court, at OSHA's expense. The court has the power to reinstate you, award back pay and take other action necessary to obtain justice for you.

A new OSHA policy makes denial of pay for the walkaround discriminatory under Section 11(c)(1) of the OSH Act. However, this new policy has not been tested in the courts. In fact, any new case must overturn a previous decision stating that denial of walkaround pay is not discriminatory.

If you file a discrimination complaint, OSHA is required to notify you within 90 days of its determination. One word of caution, though—don't expect a quick solution of your complaint. OSHA has a large backlog of complaints and some are over a year old.

The OSH Act does *not* protect you from your employer's disciplinary action if you refuse to comply with your employer's safety rules. Such disciplinary action is *not* considered discrimination. Under the OSH Act your employer is responsible for your use of proper safety equipment. Your failure to use proper equipment and to follow proper procedures can result in a citation to your *employer* and your employer can discipline or discharge you! A

more complete listing of what can and cannot be grounds for discrimination is in the back of this manual. Consult it if you have any questions.

You may also file a grievance under your collective bargaining agreement if you have been discriminated against for exercising a right under the OSH Act. Your chances of succeeding will depend in part upon the specific contract language that has been negotiated.

The National Labor Relations Board may also have jurisdiction over a discrimination case involving safety and health issues. In one case the NLRB said, "An individual's action to enhance safety at a worksite benefited his fellow employees and this constituted concerted action on behalf of co-workers within the meaning of Section 7 of the National Labor Relations Act, even though co-workers did not actively join in his complaint. . . ."

Therefore, you may be able to file a complaint with the NLRB if you had been discriminated against for exercising your rights under the OSH Act. You should note, though, you cannot be awarded more than what you lost. Neither the OSH Act nor the NLRB takes punitive action against employers who deny your rights.

RIGHT TO INFORMATION

Before you decide to make any kind of a complaint, you as an employee need a great deal of information about your worksite. You can obtain some of that information through this training program. The OSH Act also provides employees and their representatives with access to a limited amount of information. For example, the OSH Act permits employees access to copies of OSHA standards and any OSHA rules and regulations which the employer may have at the worksite. Under the OSH Act and all OSHA approved state plans, every employer is required to post a notice of employee rights at every worksite. This notice informs you of your protections and obligations under the OSH Act and how to get copies of the Act and safety and health standards.

The OSH Act authorizes the Secretary of Labor, in the process of passing standards, to require employers to monitor and measure employee exposure to toxic materials. You have the right to review the records your employer must keep of the monitoring and measuring. In some cases the employer must keep the records from twenty to thirty years.

By observing the monitoring and measuring, you can make sure your employer is taking a sample that represents the typical workplace exposure for the job being sampled. For instance, you would not want your employer to sample for silica exposure 30 minutes after sandblasting has ended. By reviewing the records of the monitoring and measuring, you can see the extent of the workplace

hazards and the dangers employees face.

OSHA standards, set by the Secretary of Labor, may require employers to offer medical examinations to their employees at no cost to the employee. These OSHA standards do not require employees to take the medical exams, only that the employer offer them. In addition, the OSH Act permits the results of the medical exams to be sent to the employee's private doctor, but only if the employee makes a specific request. Employees should select one doctor to receive the results of all medical exams. This doctor can use the medical exams to evaluate safety and health conditions at the workplace.

The frequency with which the employer must offer medical exams varies with each situation. For example, if employees are exposed to airborne concentrations of asbestos fibers, the employer must furnish medical exams yearly. In the case of vinyl chloride, the employer must furnish medical exams every six months for employees who have been employed in vinyl chloride or polyvinyl chloride manufacturing for at least 10 years and annually for all other employees.

One final word regarding medical exams under the OSH Act. There is a catch. The catch is: if the medical exam reveals that employee health is being adversely affected, the employer can transfer you, demote you or even discharge you. And you may have no recourse. To remedy this situation a "rate retention" or "full economic protection" provision should be included in every standard requiring medical exams. Such a provision would guarantee that an employee removed from his or her job due to ill health will be placed in another job, which he or she is capable of performing, at the old rate of pay or the new, whichever is higher. A rate retention provision would eliminate the fear of medical exams, since the worker will not suffer economically if he or she submits to one. This problem is especially acute in unorganized workplaces.

The Secretary of Health, Education and Welfare is also authorized to establish programs of medical examinations and tests as may be necessary for determining the incidence of occupational illnesses or for other activities that are research related. If medical exams are set up under these conditions, they will be paid for by the Secretary of HEW. You have the right to have the results of these exams sent to your private doctor.

In addition, the OSH Act requires the employer to notify the employees if they are being exposed to toxic substances above the permissible exposure limit (PEL). The employer must also notify employees of the corrective action being taken.

The back of this manual contains a list of all the OSHA regional and area offices, includ-

ing the addresses and phone numbers. You should contact the nearest OSHA office any time you have a question or complaint. The addresses and phone numbers of the OSHA offices will also be useful if at some time you forget how to exercise one of your protections under the OSH Act. You can write or call the OSHA office and an OSHA representative will explain the procedures you must go through to reach your desired goals.

STATE PLANS

Over twenty states currently have OSHA approved state safety and health plans. If you ever have a Complaint Against State Program Administration, you should contact the nearest OSHA office and file a CASPA. CASPAs, Complaint Against State Program Administration, can be made to OSHA offices in any one of the states that have an OSHA approved state plan.

A CASPA should be filed with the nearest OSHA office if you believe the administration or operation of the state plan is inadequate. Some reasons to file a CASPA complaint are excessive delays in processing cases, incomplete and inadequate workplace inspections and granting of variances without regard to the requirements of the state plan.

The CASPA complaint should be submitted in writing to the Regional Director at the OSHA office. You may submit the complaint orally, but a written complaint is better. The CASPA should state the specific aspect of the state plan you feel is inadequate; for instance, the state inspector denied your representative walkaround rights. Your name will not appear on any record published or made available.

These rights and protections are not to be exercised in a frivolous manner nor simply to harass your employer. However, if you have a valid complaint, you should not hesitate to seek a remedy.

SUMMARY OF YOUR RIGHTS

Below is a summary of employee rights and responsibilities for a safe and healthful workplace. You or your representative have the right to:

1. Review copies of OSHA standards, rules and regulations your employer may have at the worksite.
2. Request information from your employer on safety and health hazards that may exist at your worksite, on precautions that should be taken and on procedures to be followed if you are involved in an accident or exposed to a toxic substance.
3. Make a written request to the OSHA Area Director to conduct an inspection if a hazard exists at your worksite.
4. Have your name withheld from your employer if you make a written request to OSHA.

5. Be advised of OSHA actions regarding your complaint and have an informal review, if requested, of a decision not to make an inspection or issue a citation.

6. Have an authorized employee representative accompany the OSHA inspector during the inspection.

7. Respond to questions from an OSHA Compliance Officer during a workplace inspection. Workers may be asked questions concerning workplace conditions. In addition, workers may bring hazardous conditions to the attention of the OSHA Compliance Officer during the walkaround. The employee interview may be held in the OSHA area office, the employee's home, or at work. If the interview is held at work, it should be scheduled so that it will not interfere with the employer's operation.

8. Have a generally responsive discussion with the OSHA Compliance Officer at the end of the inspection. Usually, a closing conference will not be held with the employee representative since the representative had the opportunity throughout the inspection to discuss issues with the OSHA Compliance Officer.

9. File a complaint to OSHA within 30 days if you believe you have been discriminated against or otherwise penalized because of asserting a right under the OSH Act, and to be notified by OSHA of its determination within 90 days of filing.

10. Observe the monitoring and measuring of toxic substances if employees are affected by the toxic substance. Each employee shall have access to employee's records that indicate the employee's own exposure to toxic substances.

11. Submit a written request to the National Institute for Occupational Safety and Health for information on whether any substance in your workplace has potential toxic effects in the concentration being used, and have your name withheld from your employer if you so request.

12. Object to the abatement period set in the citation issued to your employer by writing to the OSHA area director within 15 working days of the issuance of the citation.

13. Be notified if your employer files a formal complaint contesting the citation, the penalty or the abatement date and be able to participate as a party in any hearing held. This is similar to when you or your representative formally

objects to the time set for abatement.

14. Be notified if your employer applied for a variance from an OSHA standard, testify at a variance hearing, and appeal the final decision if you disagree with it.
15. Submit written information or comment to OSHA on the issuance, modification or revocation of OSHA standards, and request a public hearing.

SUMMARY OF YOUR RESPONSIBILITIES

Along with your rights under OSHA, you, as employees, have certain responsibilities to maintain a safe and healthful workplace. These responsibilities should be followed for your protection and for protection of your co-workers. Remember rights and responsibilities always go hand in hand. Irresponsibility will only lead to discrediting of the OSH Act, the employee and the representatives of employees. Legislation such as the OSH Act involved long and hard fought battles. It would be senseless to throw away achievements which took so much effort to obtain. Your responsibilities are to:

1. Comply with occupational safety and health standards, rules, regulations and orders issued pursuant to the Act which are applicable to your own actions and conduct.
2. Report any hazardous condition to your employer immediately.
3. Notify your co-workers immediately of any hazards they may be exposed to.
4. Turn in defective tools.
5. Report any defective equipment or machines.
6. Follow your employer's reasonable safety and health rules.
7. Report any and all work related injuries and illnesses to your employer and seek proper treatment.
8. Cooperate with OSHA personnel.
9. Exercise your rights under the OSH Act in a responsible manner.

Finally, the OSH Act envisions a cooperative arrangement among labor, management and the government to eliminate and reduce workplace injuries and illnesses. In order to accomplish this goal, the OSH Act has devised a set of rights and responsibilities for both employers and employees.

EMPLOYER RESPONSIBILITIES

The primary responsibility of employers is to "furnish to each of its employees employment and a place of employment which are free from recognized hazards that are causing or likely to cause death or serious physical harm to employees."

This is known as the "general duty" clause since it requires employers to provide a safe place of employment even

145

when there are no specific OSHA standards governing a particular hazard. Employers can be cited by OSHA for a violation of the general duty clause only when there is no specific standard governing the hazardous condition. In addition, each employer is required to comply with all occupational safety and health standards promulgated by OSHA. Between the general duty clause and the specific standards, all possible *known* hazardous conditions are covered by OSHA.

Below is a list of specific employer responsibilities under the OSH Act. An employer must:

1. Provide a hazard-free workplace.
2. Comply with OSHA standards, rules and regulations.
3. Make copies of mandatory OSHA standards available to employees for review upon request.
4. Inform employees about OSHA.
5. Examine workplace conditions to make sure they comply with OSHA standards.
6. Eliminate or guard hazards.
7. Make sure employees have and use safe tools and equipment and that such material is properly maintained.
8. Use color codes, posters, labels or signs to warn employees of potential hazards.
9. Establish or update operating procedures and communicate them so that employees follow safety and health requirements for their own protection.
10. Provide medical examinations when required by OSHA standards.
11. Report to the nearest OSHA office, within 48 hours, the occurrence of any employment accident which is fatal to one or more employees or which results in the hospitalization of five or more employees.
12. Keep OSHA-required records of work-related injuries and illnesses, and post the annual summary during the entire month of February of each year.
13. Post, at a prominent location within the workplace, the OSHA poster, or equivalent state poster, informing employees of their rights and responsibilities.
14. Cooperate with the OSHA compliance officer by furnishing names of authorized employee representatives who may be asked to accompany the compliance officer during the inspection.
15. Never discriminate against employees who properly exercise their rights under the OSH Act.

16. **Post OSHA citations of apparent violations of standards or of the general duty clause at or near the worksite involved for at least three days.**

The act of complying with OSHA standards is more complex than it may appear at face value. Complying with standards may entail modifying equipment, installing new equipment, installing guards, training employees, purchasing personal protective equipment, providing medical examinations, monitoring and measuring employee exposure to toxic substances and maintaining records of employee exposure. This is no small task indeed!

ABOUT OSHA

The Federal Government is very active in health and safety, especially since the passage of the Occupational Safety and Health Act of 1970. Prior safety and health legislation dealt only with individual industries or with particular classes of workers; for example, the Longshoremen's and Harbor Workers' Compensation Act of 1927, the Walsh-Healy Public Contracts Act of 1936, the Contract Work Hours and Safety Standards Act as amended in August, 1969, and the Federal Mine Safety and Health Act of 1977. Out of this maze of Federal laws emerged the Occupational Safety and Health Act of 1970, which consolidated many of the previous safety and health laws into one comprehensive act.

The OSH Act covers nearly 5,000,000 workplaces and over 60,000,000 employees. The only group of workers excluded from the OSH Act's coverage are public employees, although some state, county and municipal employees are covered under OSHA-approved state health and safety laws. Though Federal employees are excluded from OSHA's coverage, each federal agency must establish a safety and health program consistent with the OSH Act. Each agency head is responsible for providing safe and healthful places of employment, acquiring, maintaining and requiring the use of safe equipment and maintaining records of all occupational injuries and illnesses.

The purpose of the Occupational Safety and Health Act is "... to assure so far as possible every working man and woman in this nation safe and healthful working conditions."

The sole aim of labor, management and government is also yours: to reduce the number and severity of work-related illnesses and injuries suffered by painters and allied tradeworkers.

In practice, responsibility for safe and healthful workplaces must be shared by employers and employees. The employers' voluntary compliance with the OSH Act, along with the tradesworkers' ability to recognize, evaluate, avoid and eliminate hazards in the work environment, is the best guarantee for reducing accidental deaths, injuries and occupational illnesses in the paint trades.

We have always known that work in the paint trades is dangerous. As General Secretary-Treasurer Petersdorf said, painters consistently rank among the top five trades in worker compensation payments.

More recent scientific studies conducted through the cooperative efforts of labor, management, government and the scientific community have defined the extent, nature and causes of many illnesses and injuries suffered by painters and allied tradesworkers. These

studies give form to the possibility of reducing illnesses and injuries by making information available directly to the worker. Some of this information is not new, such as the hazards associated with lead paint. Some information that is very important is new, such as the cancer-causing effects of benzene, a solvent used in the paint trades.

Development of this manual is funded by OSHA.

OSHA is the Occupational Safety and Health Administration, one of three agencies created by the OSH Act. Another agency is NIOSH, the National Institute for Occupational Safety and Health. The third agency is the Occupational Safety and Health Review Commission. OSHA is an agency of the Department of Labor. NIOSH is an agency of the Department of Health, Education and Welfare. The Occupational Safety and Health Review Commission is an independent agency established to hear and decide appeals on proposed citations, penalties and abatement dates. Each agency has its separate functions, but all three agencies must fulfill the purpose of the OSH Act. That purpose is ". . . . to assure so far as possible every working man and woman in this nation safe and healthful working conditions."

NIOSH, under the supervision of the Secretary of HEW, is to ". . . conduct research, experiments, and demonstrations relating to occupational safety and health." This results in criteria documents which describe safe exposure limits to toxic substances. Additionally, NIOSH performs medical examinations, studies worksites and questions employees. Also, the secretary of HEW is charged with developing training and education programs to "provide an adequate supply of qualified personnel to carry out the purposes of the Act."

OSHA is under the supervision of the Secretary of Labor. Most of you have probably heard more about OSHA than NIOSH. OSHA has been more visible because it works directly with workers and managers. For OSHA's efforts, it has gotten a lot of flack.

One myth about OSHA that persists yet today is that its sole job is to inspect. In fact, many employees and employers believe that OSHA and inspection are the same word.

OSHA is much more than inspections. How much more? On the following page are eight statements. Check the ones you think are true functions of OSHA. Also, on the scale from 1 to 10 mark your opinion of OSHA, with 1 being "Causes problems for workers and companies" and 10 being "Solves problems for workers and companies."

Below are eight activities. Which ones is OSHA responsible for? Check as many as you think are right.

___ **a. Penalize workers for violations of safety and health rules**

___ **b. Set standards requiring guards on hazardous machinery and limiting employee exposure to hazardous substances to safe levels**

___ **c. Inspect workplaces for violations of safety and health standards**

___ **d. Pay workers for injuries they receive on the job**

___ **e. Issue citations, propose penalties and require elimination of hazardous working conditions**

___ **f. Monitor and evaluate state occupational safety and health plans**

___ **g. Require employers to pay workers the "prevailing" wages on federally funded projects**

___ **h. Fine employers for polluting the air and water**

What is your opinion of OSHA? (Place an "X" on the scale)

1—Causes problems for workers and companies **5—Neutral** **10—Solves problems for workers and companies**

Let's review your answers.

A. The authority of OSHA to impose penalties is restricted to employers. Employers may be cited and fined by OSHA for the failure of their workers to use proper protective equipment or observe OSHA regulations, but OSHA cannot cite, discipline or fine the employee.

However, the employee does share with the employer the burden of improving work conditions. According to the OSH Act, an employee must "comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to the Act which are applicable to his own actions and conduct."

Consequently, an employee can be disciplined for failure to wear proper protective gear or failure to observe other OSHA regulations at the employer's direction. If an employee is discharged for not wearing protective gear required for the job, or for failing to observe other OSHA requirements, the worker may not be able to collect unemployment compensation. So even though OSHA cannot discipline workers for violating employer safety regulations, OSHA does hold employers responsible for the conduct of their employees.

B. Under Section 6 of the OSH Act, OSHA does set standards, for example, requiring guards on hazardous machinery and limiting employee exposure to toxic substances to safe levels. These standards involve many steps and often take years to develop. But OSHA's process for setting standards is comprehensive and fair. During the standard-setting process, ample time is allowed for all interested parties, including labor unions, businesses, other government agencies and individuals, to file comments, present witnesses, cross-examine the other party's witnesses and to participate in the standard-setting process. This standard-setting process is an example of the democratic process perpetuated in the OSH Act.

The standards issued by OSHA — besides setting exposure limits or requiring guards — also prescribe the use of labels or other appropriate forms of warning, provide for monitoring and measuring of toxic substances, require medical examinations or other appropriate tests, prescribe the use of personal protective equipment, and require specific technological controls which must be followed.

In writing the Occupational Safety and Health Act, the Congress realized instances would occur where, through the normal standard introduction procedures, the health and safety of workers would not necessarily be protected. In these situations, when the harmful effects of toxic substances, such as benzene, are discovered, the Secretary of Labor can temporarily bypass the normal introduction process.

When a grave new hazard is discovered, the Secretary of Labor can issue an emergency temporary standard, effective as soon as it is published in the Federal Register. The Federal Register is a publication of the Federal Government. Within six months after publication of the emergency temporary standard, the Secretary of Labor must then issue a standard through the normal rule-making process.

Emergency temporary standards have generally failed in their purpose. Take the case of the emergency temporary standard for benzene. Shortly after the standard was issued, industry organizations went to court and obtained a stay of enforcement. In that case, employer efforts temporarily halted enforcement of a stricter and safer standard.

The Occupational Safety and Health Act, Section 6, also permits the Secretary of Labor to issue variances from occupational safety and health standards. A variance allows an employer to deviate from a standard by meeting certain requirements. One requirement is that the employer take steps to safeguard the safety and health of employees by providing conditions as safe as those that would prevail if the employer complied with the standard. Variances may be either temporary or permanent. Temporary variances are issued if an employer "is unable to comply with a standard by its effective date because of unavailability of professional or technical personnel or of materials and equipment needed to come into compliance with the standard or because necessary construction or alteration of facilities cannot be completed by the effective date." Permanent variances are issued if the employer "demonstrates that the methods or processes used will provide employment or places of employment to employees which are as safe and healthful as those which would prevail if the employer complied with the standard." You, as employees, have the right to present your objections to OSHA if your employer requests a variance.

C. OSHA does inspect workplaces for violations of safety and health standards. After taking the trouble to write standards to protect the workers, someone has got to make sure the standards are enforced. Enforcement is the job of the OSHA Compliance Officer, authorized under section 8 of the OSH Act.

The OSHA Compliance Officer is authorized to enter workplaces without delay to assess compliance with OSHA standards. This authority includes the right to question employers and employees privately, the right to inspect records and the right to subpoena witnesses and evidence. During the inspection, a representative of the employer and a representative of the employees are offered an opportunity to accompany the OSHA Compliance Officer on the walkaround.

In places of employment where the employees are not represented by an organization, such as a labor union, and no employee representative has been selected to represent them, the OSHA Compliance Officer will interview a number of employees during the walk-around inspection to ascertain facts on subjects of the Compliance Officer's choosing.

The OSH Act allows employees to request an inspection of the workplace if they believe a hazard exists which threatens physical harm or is an imminent danger. OSHA reserves the right to determine whether an inspection will occur, based upon the merit of the complaint and the alleged danger. Nearly one-third of OSHA inspections are initiated as a result of employee complaints.

You can't rely totally on OSHA Compliance Officers to keep your jobsite safe and healthy. Not surprisingly, OSHA is able to inspect about 41,000 of the 5,000,000 workplaces yearly. The odds of your workplace being inspected by OSHA are less than one in one hundred. And even if your workplace is inspected, those few hours or days of observation by an OSHA Compliance Officer won't protect you 365 days a year.

E. OSHA does, however, issue citations, propose penalties and require elimination of hazardous conditions. These activities are authorized under Section 9 of the OSH Act. The citation must describe the standards violated and set a reasonable time for the employer to correct the problem. The employer is required to post a copy of the citation immediately near the site where the violation occurred. The posting of the citation serves notice to you that a violation has occurred.

The OSH Act sets different penalties for different types of violations. An employer can contest the amount of any proposed penalty, and if successful, may have the penalty reduced. Employees are only permitted to contest the time set for abatement whereas the employer can contest the citation, penalty and the time set for abatement.

The Occupational Safety and Health Review Commission, established by the OSH Act, hears and decides appeals of citations, proposed penalties and abatement periods. The Occupational Safety and Health Review Commission is a quasi-judicial body, complete with administrative law judges. A decision rendered by the Commission that is unacceptable may be appealed to the Federal Appeals Court.

F. Section 18 of the OSH Act gives the Secretary of Labor the power to approve, monitor and reject state safety and health plans. A state plan is a mini-occupational safety and health act for a state that meets guidelines established by OSHA. OSHA also keeps an eye on state plans to make sure

they meet basic minimum requirements. When a state fails to meet the minimum requirements, OSHA may withdraw approval of the plan and reassert its authority. Do you live in one of the states or territories with an OSHA-approved state plan?

In the back of this manual are the names, addresses and phone numbers of the individuals responsible for administration of the state plans. For those of you covered by OSHA-approved state plans, remember: you have the same rights and responsibilities as workers covered directly by OSHA. The only exception is that OSHA-approved state plans cover public employees, while OSHA does not.

If the state fails to protect your rights, you can file a CASPA complaint with OSHA. CASPA stands for Complaint Against State Program Administration. Denial of employee walkaround rights, refusal to cite violations and failure to process complaints are only a few of the grounds for filing a CASPA. CASPA's are one of the methods used by OSHA to evaluate a state's performance and to make recommendations when improvement is needed.

G. This is not the responsibility of OSHA. The Wage-Hour Division of the Department of Labor is responsible for administering laws, such as the Davis-Bacon Act, which require employers on federally funded construction projects to pay the prevailing wage.

H. Again, this is not the responsibility of OSHA. The U.S. Environmental Protection Agency administers environmental laws such as the Clean Air Act, the Clean Water Act and the Toxic Substances Control Act. These laws protect the public at large from hazardous substances, whereas OSHA's protections target only workers. Although the Environmental Protection Agency and OSHA administer different laws, their general purposes are the same: to reduce the harmful effects of hazardous substances. In practice, the Environmental Protection Agency and OSHA share information and work together for your benefit.

As you can see in these provisions, OSHA sets standards and inspects for compliance with the standards; when they are not followed, OSHA has the power to impose fines and penalties. These three activities—setting, inspecting for compliance and enforcing regulations—are all crucial to OSHA's effectiveness.

But OSHA is also empowered to "provide for the establishment and supervision of programs for the education and training of employers and employees in the recognition, avoidance and prevention of unsafe and unhealthful working conditions." This manual is a product of that mandate.

SAFETY AND HEALTH COMMITTEES

The scientific community contributes to occupational safety and health by conducting research.

The government contributes to occupational safety and health by setting and enforcing standards.

The Brotherhood contributes to occupational safety and health through union policy and enforcement of health and safety provisions, through lobbying and through developing this manual.

But, how do you contribute?

You contribute by following proper safety procedures, reporting dangerous tools and equipment, reporting hazards, cooperating with your employer and participating in your local union.

Safety and health in the workplace can be improved through cooperative labor-management efforts. Safety and health committees and negotiated safety and health clauses are only two methods used by labor and management to improve working conditions.

Effective communication between workers and management overcomes barriers to safer and healthier workplaces. The safety and health committee should act as a two-way street — information flowing from you to your employer and visa versa.

Upon discovering a hazard, tell your supervisor. Your supervisor should take steps to eliminate the hazard and should also convey the information to the safety and health committee. If management personnel are not aware of hazards, they cannot act to eliminate them. In this case the information flows from you to management.

Information should also flow from management to you through the safety and health committee. For example, whenever a new process, machine or tool is instituted, management must inform you of its hazards and of all available control methods for avoiding injury and illness. Also, if new hazards are discovered in existing equipment, the safety and health committee should inform the workers and develop appropriate control measures.

Conducting safety and health training seminars is also a job for the safety and health committee. Employee and employer rights and responsibilities, proper use of personal protective equipment, hazard control and first aid procedures are only some of the possible subjects of a safety and health seminar.

What else can a safety and health committee do? Use your imagination. Following are several possibilities; check the ones you think are correct.

A safety and health committee should have many functions. Below are several possibilities. Check the ones you think are appropriate.

A safety and health committee should:

___1. Harass the employer by filing OSHA complaints for frivolous reasons.

___2. Conduct workplace inspections.

___3. Conduct investigations after any work-related accident.

___4. Take two hours for lunch at a fancy restaurant.

___5. Keep records of all work-related accidents, injuries and illnesses.

A safety and health committee should not harass employers by filing OSHA complaints for frivolous reasons (Number 1). Any complaint filed with OSHA should be based strongly in fact and not for purposes of harassment. Crying "wolf" on safety and health issues is irresponsible and self-defeating.

How about conducting inspections (Number 2)? The safety and health committee should conduct monthly workplace inspections. The inspection should include a walk through the worksite, interviews with employees and close inspection of tools and equipment. Dangerous and defective tools and equipment should be tagged for repair or replaced.

Besides the routine monthly inspection, the safety and health committee should conduct an investigation after each and every work-related accident (Number 3). The purpose of the investigation is to determine the cause of the accident. The investigators must look at many factors. Did the machine or tool fail? If so, why? Was the cause of the accident a human error? If so, did the worker have sufficient training to do the job? Did the worker normally perform the task or was it a new task for him/her? Was the worker under medication? Were toxic substances present which could have affected the worker's judgment? The questions go on and on until the bottom line is reached. The safety and health committee must be as thorough as Sherlock Holmes and run down every lead.

Whether or not the committee takes two hours for lunch at a fancy restaurant is not important (Number 4). What is important is the work the committee does. The committee should not abuse privileges, nor should it be a playground or a political payoff for members.

The committee must also keep records of all work-related accidents and their resultant injuries and illnesses (Number 5). Even if an accident does not result in injury or illness, a report should be filled out. Next time someone might be hurt. The reports can reveal recurring accidents. When a recurring accident is discovered, causes should be determined and preventive action taken.

How is the safety and health committee supposed to do all this?

First, the committee must be established according to specific guidelines. The contract language establishing the safety and health committee must be precise. Avoid contract language cloaked in vague phrases such as, "each local union and appropriate management representative will meet on a regularly scheduled basis to discuss and advise on all matters pertaining to safety." Such phrases are so vague as to be meaningless. In addition, this language places the committee in a mere advisory role—the committee's recommendations do not have to be followed.

The contract language should state the functions of the committee, such as: "to inspect and investigate the workplace monthly, to investigate all accidents, to establish safety and health rules and regulations, to conduct training sessions, to develop methods to reduce and eliminate hazards, to resolve safety and health grievances prior to arbitration, to shut down extremely hazardous processes, including machines, to collect and review accident statistics, and other necessary studies." Moreover, a general statement of function should be included to cover all possible situations.

The safety and health committee must have an equal number of labor and management representatives. In addition, the labor representatives must be selected by the workers through their union—not by management. Equal representation insures that both sides are heard and prevents one side from railroading the other when the committee conducts its business. The possibility of a deadlock may force both sides to compromise.

The chair of the committee should rotate among the members, alternating between labor and management. Again, this prevents one side from dominating the proceedings.

Monthly meetings are a minimum. Additionally, either labor or management should be able to call ad hoc meetings if the need arises. The worker representative should not be docked time or benefits for attending meetings or for performing any duties related to his/her function as a member of the committee.

Finally, both sides must agree to the minutes of the monthly meetings. The minutes reflect the decisions and actions of the committee. To avoid misrepresentations, both labor and management must agree to the minutes before they become official.

One last word regarding joint safety and health committees: If the committee is not benefitting you, pull out of the committee. You see, the committee benefits not only you but also management. A safety and health committee is good public relations for management and good P.R. means good sales which mean good profits — at your expense if the committee isn't doing its job.

The existence of a safety and health committee can also reduce any fines to the employer levied by OSHA. The OSH Act provides up to 30% reduction in penalties for OSHA violations if the employer demonstrates "good faith." The establishment of a joint safety and health committee can be evidence of "good faith." Therefore, make sure your committee works for you because if it doesn't, your employer may be getting a monetary savings at the expense of your health and safety.

APPENDIX I

INDEX

Aliphatic Hydrocarbons 1
- Alicyclic hydrocarbons
  - Cyclohexane
  - Methylcyclohexane
- Naphthas
  - Coal tar
  - Petroleum
- Paraffin
- Turpentine
  - Gum turpentine
  - Oil of turpentine

Alcohols 2
- Amyl alcohols
- n-Butyl alcohol
- Ethyl alcohol
- Ethylene chlorohydrin
- Methyl alcohol
- Propyl alcohol

Glycols and Derivatives 4
- Ethylene glycol
- Ethylene glycol ethers and derivatives
  - Ethylene glycol monoethyl ether
  - Ethylene glycol monoethyl ether acetate
  - Ethylene glycol monomethyl ether
  - Ethylene glycol monomethyl ether acetate
  - Ethylene glycol monobutyl ether

Ethers and Epoxy Compounds 5
- Dichloroethyl ether
- Dioxane
- Epichlorohydrin

Esters 7
- Acetates
  - Methyl acetate
  - Ethyl acetate
  - n-Propyl acetate
  - iso-Propyl acetate
  - n-Butyl acetate
  - Amyl acetate
- Ethyl silicate

Carboxylic Acids and Anhydrides 7
- Acetic acid
- Formic acid

Aldehydes and Ketones 8
- Acetaldehyde
- Furfural
- Ketones
  - Acetone
  - Diacetone
  - Methyl ethyl ketone
  - Methyl n-propyl ketone
  - Methyl n-butyl ketone
  - Methyl iso-butyl ketone

Aliphatic Halogenated Hydrocarbons 10
- Carbon tetrachloride
- Chloroform
- 1,2-Dibromoethane
- 1,2-Dichloroethane
- 1,2-Dichloroethylene
- Methyl bromide
- Methylene chloride
- Tetrachloroethane
- Tetrachloroethylene
- 1,1,1-Trichloroethane
- Trichloroethylene
- Vinyl chloride
- Isocyanates
  - Toluene diisocyanate
  - Methylene bisphenyl isocyanate

Aromatic Hydrocarbons 15
- Benzene
- Styrene/Ethyl benzene
- Toluene
- Xylene

Phenols and Phenolic Compounds 17
- Cresol
- Phenol

Aromatic Halogenated Hydrocarbons 18
- Chlorodiphenyls and derivatives
- Chlorinated benzenes

Aromatic Amines 19
- Aniline
- Nitrobenzene
- Nitroparaffins

Miscellaneous Organic Nitrogen Compounds 21
- Pyridine
- Carbon Disulfide

Metals 22
- Arsenic
- Antimony and compounds
- Barium and compounds
- Cadmium and compounds
- Chromium and compounds
- Cobalt and compounds
- Copper and compounds
- Iron and compounds
- Lead—inorganic
- Manganese and compounds
- Titanium and compounds
- Zinc oxide

Miscellaneous Compounds 29
- Carbon monoxide
- Sodium hydroxide/Potassium hydroxide
- Sulfuric acid
- Asbestos
- Petroleum spirits
- Vinyl acetate
- Silica

APPENDIX I

This appendix contains a brief description of each of the most widely used substances of the paint and allied trades, including synonyms, potential occupational exposures, permissible exposure limits, routes of entry, harmful effects, medical surveillance and special tests and personal protective methods.

ALIPHATIC HYDROCARBONS

Aliphatic hydrocarbons are used industrially in mixtures, such as petroleum naphtha, gasoline, kerosene and mineral spirits.

Aliphatic hydrocarbons cause asphyxiation and depression of the central nervous system. Another common effect is irritation of the skin and mucous membranes of the upper respiratory tract. Repeated and prolonged skin contact may result in dermatitis. Breathing mists of the liquids may result in chemical pneumonitis, pulmonary edema and hemorrhage. Aliphatic hydrocarbons can be contaminated by benzene, which significantly increases the hazard.

Alicyclic Hydrocarbons

Description: Cyclohexane; methylcyclohexane.

These compounds are colorless liquids.

Synonyms: None.

Potential Occupational Exposures: Uses vary with compounds. Cyclohexane is used as a solvent for fats, oils, waxes, resins and in certain synthetic rubbers. Methylcyclohexane is used as a solvent for cellulose ethers and in the production of organic synthetics.

A partial list of occupations in which exposure may occur includes: Lacquerers, Paint Removers, Varnish Removers, Painters and Paint Makers.

Permissible Exposure Limits: The Federal standards are: Cyclohexane 300 ppm (1050 mg/m^3); Methylcyclohexane 500 ppm (2000 mg/m^3). *Note:* The 1976 ACGIH lists a TLV of 400 ppm (1,600 mg/m^3) for methylcyclohexane.

Route of Entry: Inhalation of gas or vapor.

Harmful Effects

Local—Repeated and prolonged contact with liquid can cause dermatitis. Mild eye irritation may result from acute vapor exposure.

Systemic—Alicyclic hydrocarbons are central nervous system depressants. Symptoms of acute exposure are excitement, loss of equilibrium, stupor, coma and, rarely, death as a result of respiratory failure. Severe diarrhea and vascular collapse resulting in heart, lung, liver and brain degeneration have been reported in oral administration of alicyclic hydrocarbons to animals.

The danger of chronic poisoning is relatively slight because these compounds are almost completely eliminated from the body. Damage to the blood-production system does not occur except when exposure is compounded with benzene, which may be a contaminant.

Medical Surveillance: Check effects to the skin, respiratory tract, kidneys and liver.

Special Test: Blood and urine.

Personal Protective Methods: Skin protection with barrier creams or gloves.

Workers exposed to high concentrations of gas or vapor need respirators.

Naphtha

Description: Naphthas are derived from both petroleum and coal tar.

Benzene is present in those coal tar naphthas with low boiling points.

Synonyms: Petroeum naphtha: ligroin, benzine, petroleum ether, petroleum benzine, solvent naphtha.

Potential Occupational Exposures: Naphthas are used as organic solvents for dissolving rubber, oils, greases, bituminous paints, varnishes and plastics. Also, naphthas are used as a base for bituminous paints, in certain varnishes and as a waterproofing agent in adhesives and rubber products.

A partial list of occupations in which exposure may occur includes: Painters, Floorcoverers, Stainers, Varnish Makers and Paint Makers.

Permissible Exposure Limits: The Federal standard for petroleum naphtha is 500 ppm (2,000 mg/m^3); for coal tar naphtha it is 100 ppm (400 mg/m^3).

Route of Entry: Inhalation of vapor. Skin absorption of liquid is probably not important in development of systemic effects unless benzene is present.

Harmful Effects

Local—The naphthas are irritating to the skin, eyes, and the upper respiratory tract. Skin "chapping" and photosensitivity may develop after repeated contact with the liquid. If confined against skin by clothing, the naphthas may cause skin burn.

Systemic—Petroleum naphtha is less toxic than naphthas made from coal tar. Naphthas cause central nervous system depression. Symptoms include inebriation, followed by headache and nausea. In severe cases, dizziness, convulsions and unconsciousness occasionally result. Persistent loss of appetite and nervousness have been reported for several months following an acute overexposure, but this appears to be rare. If benzene is present, coal tar naphthas may produce blood changes such as leukopenia, aplastic anemia or leukemia. The kidneys and spleen have also been affected in animal experiments.

Medical Surveillance: Check effects to the central nervous system. If benzene is present, workers should have a periodic complete blood examination.

Special Tests: None in common use.

Personal Protective Methods: Workers should use barrier creams, protective clothing, gloves and respirators where exposure to the vapor is likely.

Paraffin

Description: Paraffin is a white, somewhat translucent solid.

Synonyms: Paraffin wax, hard paraffin.

Potential Occupational Exposures: Paraffin is used in the manufacture of varnishes and floor polishes.

A partial list of occupations in which exposure may occur includes: Polish Makers and Varnish Makers.

Permissible Exposure Limits: Paraffin wax fume has no established Federal standard; however, in 1975 the ACGIH recommended a TLV of 0.2 mg/m^3 for paraffin wax fume.

Route of Entry: Inhalation of fumes.

Harmful Effects

Local—Occasionally, sensitivity reactions have been reported.

Chronic exposure can produce chronic dermatitis, wax boils and other skin problems.

Systemic—Cancer of the scrotum in wax pressworkers exposed to crude petroleum wax has been documented. Other malignant lesions in workers using finished paraffin are less well documented. The lesions can develop into regional inguinal and pelvic lymph nodes. Paraffinoma has been reported from use of paraffin for cosmetic purposes.

Medical Surveillance: Check the skin. Surveillance should be continued indefinitely.

Special Tests: None appear useful.

Personal Protective Methods: Strict personal hygienic measures and protective clothing.

Turpentine

Description: The crude oleoresin (gum turpentine) is a yellowish, sticky, opaque mass and the distillate (oil of turpentine) is a colorless, volatile liquid.

Synonyms: Gum turpentine, oil of turpentine, spirit of turpentine, gum spirit, gum (derived from pine resin), wood turpentine (derived from pine stumps), sulfate wood pulp waste.

Potential Occupational Exposures: Turpentines have found wide use in the manufacture of floor and furniture polishes, cleaning materials, paint thinners and resins.

A partial list of occupations in which exposure may occur includes: Furniture Polish Makers, Lacquer Makers, Paint Workers, Stain Makers and Varnish Workers.

Permissible Exposure Limits: Federal standard for turpentine is 100 ppm (560 mg/m^3).

Route of Entry: Inhalation of vapor and skin absorption of liquid are the usual paths of occupational exposure.

Harmful Effects

Local—High vapor concentrations are irritating to the eyes, nose and bronchi. Breathing mists of liquid can cause direct lung irritation, resulting in pulmonary edema and hemorrhage. Turpentine liquid may produce contact dermatitis. This hypersensitivity usually develops in a small portion of the working population. Eczema from turpentine is quite common. Liquid turpentine splashed in the eyes can cause corneal burns and demands emergency treatment.

Systemic—Turpentine vapor in acute concentrations can cause central nervous system depression. Symptoms include headache, loss of appetite, anxiety, excitement, mental confusion and ringing in the ears. Convulsions, coma, and death have been reported in animal experiments.

Turpentine vapor also produces kidney and bladder damage. Predisposition to pneumonia may also occur from exposure. Recovery usually takes from a few days to a few weeks.

Medical Surveillance: Check for skin disease, skin allergies, liver, kidney and respiratory disease.

Special Tests: None in common use.

Personal Protective Methods: Rubber gloves, protective clothing, and respirators for high concentrations.

ALCOHOLS

The alcohols are widely used as industrial solvents in a variety of products.

In general, alcohols are irritating to mucous membranes. Their toxicity varies, but usually they produce some narcotic effect. They have some disinfectant action and most are absorbed to some extent through the skin.

Amyl Alcohol

Description: Amyl alcohols are colorless liquids, except the isomer 2-dimethyl-1-propanol, which is a crystalline solid.

Synonyms: Pentanol, pentyl alcohol, fusel oil, grain oil, potato spirit, potato oil.

Potential Occupational Exposures: Amyl alcohols are used in the manufacture of lacquers, paints, varnishes and paint removers.

A partial list of occupations in which exposure may occur includes: Lacquer Makers, Painters, Paint Makers and Varnish Makers.

Permissible Exposure Limits: The Federal standard for 3-methyl-1-butanol (isoamyl alcohol) is 100 ppm (360 mg/m^3). There are no standards for the other isomers.

Route of Entry: Inhalation of vapor, skin absorption.

Harmful Effects

Local—The liquid and vapor are mild irritants to the eyes, upper respiratory tract and skin.

Systemic—In low concentrations, amyl alcohol may cause irritation of nose and throat, nausea, vomiting, flushing, headache, double vision, disorientation and muscular weakness. In higher dosage, it is a narcotic.

Medical Surveillance: Check the skin and respiratory tract.

Special Tests: None in common use. Amyl alcohol can be detected in blood.

Personal Protective Methods: Barrier creams and personal protective clothing should be used to prevent skin contact.

n-Butyl Alcohol

Description: n-Butyl alcohol is a colorless volatile liquid with a pungent odor.

Synonyms: 1-Butanol, butyl hydroxide, propylcarbinol, butyric alcohol, hydroxybutane, n-butanol, n-propylcarbinol.

Potential Occupational Exposures: n-Butyl alcohol is used as a solvent for paints, lacquers (especially those used as automobile paints), varnishes, natural and synthetic resins and gums. It is also used in the manufacture of shellac.

A partial list of occupations in which exposure may occur includes: Lacquerers, Stainers, Varnish Makers and Painters.

Permissible Exposure Limits: The Federal standard is 100 ppm (300 mg/m^3). *Note:* the 1976 ACGIH lists a TLV of 50 PPM (150 mg/m^3).

Route of Entry: Inhalation of vapor and skin absorption.

Harmful Effects

Local—The liquid is a primary skin irritant. The vapor irritates the eyes, nose and throat. A mild keratitis characterized by corneal vacuoles has been noted at vapor concentrations over 200 ppm.

Systemic—Inhalation of high concentrations, in addition to the local effects, has produced transitory and persistent dizziness with Meniere's syndrome. Slight headache and drowsiness may also occur.

Medical Surveillance: Check the eyes, respiratory tract and skin.

Special Tests: None have been used. Blood levels can be determined.

Personal Protective Methods: Barrier creams and protective clothing should be used where skin contact may occur.

Ethyl Alcohol

Description: Ethyl alcohol is a colorless, volatile, flammable liquid.

Synonyms: Ethanol, grain alcohol, spirit of wine, cologne spirit, ethyl hydroxide, ethyl hydrate.

Potential Occupational Exposures: Ethyl alcohol is a solvent or processing agent in the manufacture of lacquers, polishes, synthetic resins, nitrocellulose and adhesives.

A partial list of occupations in which exposure may occur includes: Adhesive Makers, Lacquer Makers, Shellac Processors, Stainers and Painters.

Permissible Exposure Limits: Federal standard is 1,000 ppm (1,900 mg/m^3).

Route of Entry: Inhalation of vapor and skin absorption.

Harmful Effects

Local—Mild irritation of the eyes, nose and skin.

Systemic—Prolonged inhalation of high concentrations, besides the local effect on the eyes and upper respiratory tract, may produce headache, drowsiness, tremors and fatigue. Tolerance may be a factor in individual response to a given air concentration.

Bizarre symptoms (other than typical manifestations of intoxication) may result from the denaturants often present in industrial ethyl alcohol. Ethyl alcohol increases the toxicity of other inhaled, absorbed or ingested chemical agents. An exception is methanol where ethyl alcohol counteracts methanol toxicity.

Medical Surveillance: No special considerations needed.

Special Tests: Blood, urine and expired air.

Personal Protective Methods: Personal protective equipment is recommended where skin contact may occur.

Ethylene Chlorohydrin

Description: Ethylene chlorohydrin is a colorless liquid with an ether-like odor.

Synonyms: Glycol chlorohydrin, 2-chloroethanol, beta-chloroethyl alcohol.

Potential Occupational Exposures: In the lacquer industry, ethylene chlorohydrin is used as a solvent for cellulose acetate, cellulose esters, resins and waxes.

A partial list of occupations in which exposure may occur includes: Lacquer Makers, Resin Workers and Painters.

Permissible Exposure Limits: Federal standard is 5 ppm (16 mg/m^3).

Route of Entry: Inhalation of vapor, skin absorption of liquid.

Harmful Effects

Local—High vapor concentrations are irritating to the eyes, nose, throat and skin.

Systemic—Ethylene chlorohydrin is extremely toxic and in addition to local irritation of eyes, respiratory tract and skin, inhalation of the vapor may produce nausea, vomiting, dizziness, headache, thirst, delirium, low blood pressure, collapse and unconsciousness. The urine may show red cells, protein and casts. Death may occur in high concentrations with damage to the lungs and brain. There is little margin of safety between early reversible symptoms and fatal intoxication.

Medical Surveillance: A complete history and physical should be performed. Examination of the respiratory system, liver, kidneys, skin and central nervous system should be stressed. A chest X-ray should be taken and pulmonary function tests performed (FVC-FEV).

The above procedures should be repeated on an annual basis, except that the X-ray is needed only when indicated by pulmonary function testing.

Special Tests: None commonly used. Presence in blood can probably be determined by appropriate gas chromatographic methods.

Personal Protective Methods: The liquid readily penetrates rubber. Protective clothing other than rubber should be used. Barrier creams may be used and scrupulous personal hygiene should be practiced. Respirators should be worn where there is vapor concentrations.

Methyl Alcohol

Description: Methyl alcohol is a colorless, volatile liquid with a mild odor.

Synonyms: Methanol, carbinol, wood alcohol, wood spirit.

Potential Occupational Exposures: Methyl alcohol is used as an industrial solvent for resins and adhesives. It is an ingredient in paint and varnish removers, cleaning and dewaxing preparations and enamels.

A partial list of occupations in which exposures may occur includes: Painters, Paint Makers and Varnish Workers.

Permissible Exposure Limits: Federal standard is 200 ppm (260 mg/m^3).

Route of Entry: Inhalation of vapor; skin absorption of liquid.

Harmful Effects

Local—Contact with liquid can produce defatting and a mild dermatitis. Methyl alcohol is virtually non-irritating to the eyes or upper respiratory tract below 2,000 ppm, and it is difficult to detect by odor at less than this level.

Systemic—Methyl alcohol may cause optic nerve damage, blurring of vision, pain in eyes, loss of central vision or blindness. Other central nervous system effects result from narcosis and include headache, nausea, giddiness and loss of consciousness. These symptoms occur principally after oral ingestion and are very rare after inhalation.

Medical Surveillance: Check eye disease, visual acuity and skin, liver, and kidney functions.

Special Tests: Blood and Urine.

Personal Protective Methods: Barrier creams, protective clothing and respirators.

Propyl Alcohol

Description: There are two kinds of propyl alcohol. Both are colorless, volatile liquids.

Synonyms: n-Propyl alcohol: 1-Propanol, propylic alcohol. Isopropyl alcohol: Isopropanol, 2-Propanol, secondary propyl alcohol, dimethylcarbinol.

Potential Occupational Exposures: Isopropy alcohol is used as a solvent in resins and plastics and nitrocellulose lacquers. n-Propyl alcohol is used in lacquers and polishes. It is a solvent for gums and resins, shellac, certain synthetic resins, ethyl cellulose and butyral.

A partial list of occupations in which exposure may occur includes: Stainers, Paint Makers and Painters.

Permissible Exposure Limits: The Federal standard for n-propyl alcohol is 200 ppm (500 mg/m^3) and for isopropyl alcohol, 400 ppm (980 mg/m^3).

Route of Entry: Isopropyl alcohol: Inhalation of vapor. n-Propyl alcohol: Inhalation of vapor, skin absorption.

Harmful Effects

Local—The two kinds of propyl alcohol are similar in physical and in most physiological properties. The vapors are mildly irritating to the eyes and upper respiratory tract.

Systemic—No cases of poisoning from industrial exposure have been recorded. n-Propyl alcohol can produce mild central nervous system depression; isopropyl alcohol is potentially narcotic in high concentrations.

Medical Surveillance: No specific considerations are needed:

Special Tests: Blool, urine and body tissues.

Personal Protective Methods: Clothing and barrier creams are recommended.

GLYCOLS AND DERIVATIVES

Glycols are colorless, viscous liquids. Because these compounds are soluble in alcohol and water and have high boiling and low freezing points, they are used as solvents and antifreeze. Ethylene glycol, like ethyl alcohol, is often called by the class name, i.e., glycol. These compounds have relatively low toxicity, and the major hazard appears when the liquids are heated during processing.

Ethylene Glycol

Description: Ethylene glycol is a colorless, odorless, viscous liquid with a sweetish taste.

Synonyms: 1, 2-Ethanediol, glycol alcohol, glycol, EG.

Potential Occupational Exposures: Ethylene glycol is used as a solvent.

A partial list of occupations in which exposure may occur includes Paint Makers and Painters.

Permissible Exposure Limits: There is no Federal standard; however, ACGIH in 1975 recommended a TLV of 10 mg/m^3 for particulate ethylene glycol and 100 ppm (260 mg/m^3) for the vapor form.

Route of Entry: Inhalation of particulate or vapor. Skin absorption may also contribute to intoxication.

Harmful Effects

Local—None.

Systemic—Ethylene glycol's vapor pressure is such that at room temperature toxic concentrations are unlikely to occur. Poisoning from vapors usually occurs only if ethylene glycol liquid is heated; therefore, occupational exposure is rare. Chronic symptoms and signs include: loss of appetite, decreased urine, involuntary eye movement, lymphocytosis and loss of consciousness. Inhalation seems to result primarily in central nervous system depression and interference with blood production, whereas ingestion can result in depression followed by respiratory and cardiac failure and kidney and brain damage.

Medical Surveillance: No special considerations are needed.

Special Tests: Urine.

Personal Protective Methods: Respirators should be worn in areas of vapor concentration.

Ethylene Glycol Ethers and Derivatives

Description: Ethylene glycol monoethyl ether, ethylene glycol monoethyl ether acetate, ethylene glocol monomethyl ether, ethylene glycol monomethyl ether acetate, ethylene glycol monobutyl ether. These substances are colorless liquids with a slight odor.

Synonyms: Ethylene glycol monoethyl ether: cellosolve, 2-ethoxyethanol.

Ethylene glycol monoethyl ether acetate: cellosolve acetate, 2-ethoxyethyl acetate.

Ethylene glycol monoethyl ether: methyl cellosolve, 2-methoxyethanol.

Ethylene glycol monomethyl ether acetate: methyl cellosolve acetate, 2-methoxyethyl acetate.

Ethylene glycol monobutyl ether: butyl cellosolve, 2-butoxyethanol.

Potential Occupational Exposures: Ethylene glycol ethers are used as solvents for resins, lacquers, paints, varnishes, gums and as a constituent of painting pastes, cleaning compounds and nitrocellulose. Acetate derivatives are used in the preparation of lacquers, enamels and adhesives and to dissolve resins and plastics.

A partial list of occupations in which exposure may occur includes: Lacquer Makers, Stainers, Painters and Paint Makers.

Permissible Exposure Limits: Federal standards for these compounds are: Ethylene glycol monoethyl ether, 200 ppm (740 mg/m^3); ethylene glycol monoethyl ether acetate, 100 ppm (540 mg/m^3); ethylene glycol monomethyl ether, 25 ppm (80 mg/m^3); ethylene glycol monomethyl ether acetate, 25 ppm (120 mg/m^3); ethylene glycol monobutyl ether, 50 ppm (240 mg/m^3).

ACGIH in 1975 recommended a TLV of 25 ppm (120 mg/m^3) for ethylene glycol monomethyl ether acetate.

Route of Entry: Inhalation of vapor and skin absorption of liquid.

Harmful Effects

Local—Ethylene glycol ethers are irritating to the skin, eyes and upper respiratory tract. Temporary corneal clouding may also result and may last several hours. Acetate derivatives cause greater eye irritation than the parent compounds. The butyl and methyl ethers may penetrate skin readily.

Systemic—Acute exposure to these compounds results in narcosis, pulmonary edema and severe kidney and liver damage. Symptoms from repeated overexposure to vapors are fatigue and lethargy, headache, nausea, loss of appetite and tremor. Anemia and encephalopathy have been reported with ethylene glycol monomethyl ether. Acute poisoning by ingestion resembles ethylene glycol toxicity, with death from kidney failure.

Medical Surveillance: Check the blood, central nervous system, kidney and liver functions, skin and respiratory tract.

Special Test: None currently used.

Personal Protective Methods: Use goggles and protective clothing to prevent skin absorption. Respiratory protection may be needed if ventilation is poor or if compounds are heated or atomized.

ETHERS AND EPOXY COMPOUNDS

Ethers are colorless, volatile liquids, used industrially as solvents. Ethyl ether has been used as a general anesthetic and has been historically known as "ether." Occupational exposure to chlorinated ethers is much more significant. Two compounds, bischloromethyl ether and chloromethyl methyl ether have produced cancer and have received much attention recently. Dioxane, although it is not chlorinated, has also shown the potential to cause tumors. Skin, eye and mucous membrane irritation is common to all the chemicals covered. Pulmonary edema, with the added hazard of delayed appearance, may also occur as a result of particular ether exposures.

Dichloroethyl Ether

Description: Dichloroethyl ether is a clear, colorless liquid with a pungent, fruity odor.

Synonyms: Dichloroether, dichloroethyl oxide, sym-dichloroethyl ether, bis-(2-chloroethyl) ether, 2, 2-di-chloroethyl ether, chlorex.

Potential Occupational Exposures: Dichloroethyl ether is used in the manufacture of paint, varnish, lacquer and finish remover. It is also used as a solvent for cellulose esters, naphthalenes, oils, fats, greases, pectin, tar and gum.

A partial list of occupations in which exposure may occur includes: Lacquer Makers, Paint Makers, Varnish Workers and Painters.

Permissible Exposure Limits: The Federal standard for dichloroethyl ether is 15 ppm (90 mg/m^3); however, the ACGIH recommended TLV in 1975 was 5 ppm (30 mg/m^3).

Route of Entry: Inhalation of vapor, skin absorption.

Harmful Effects

Local—Irritation of the eyes and upper respiratory tract, coughing and nausea can result from exposure to vapor. Vapors in minimal concentrations (3 ppm) are distinctly irritating and serve as a warning property.

Systemic—The chief hazard in industrial practice is a mild bronchitis which may be caused by repeated exposure to low concentrations.

Medical Surveillance: Check skin, eyes and respiratory tract and the central nervous system.

Special Tests: None have been proposed.

Personal Protective Methods: In cases of vapor concentrations, protective clothing with full-face respirator with air supply should be worn. Skin protection (gloves, protective clothing) is needed to prevent skin absorption. Goggles should be used to prevent eye burns.

Dioxane

Description: Dioxane is a volatile, colorless liquid that may form explosive peroxides during storage.

Synonyms: 1, 4-Diethylene dioxide, diethylethene ether, 1,4-dioxane, para-dioxane, dioxan.

Potential Occupational Exposures: Dioxane's primary use is as a solvent for cellulose acetate, lacquers, plastics, paints, polyvinyl polymers, resins, varnishes and waxes. It is most used in paint and varnish strippers.

A partial list of occupations in which exposure may occur includes: Adhesive Workers, Cellulose Acetate Workers, Lacquer Makers, Paint Makers, Varnish Remover Makers and Painters.

Permissible Exposure Limits: The Federal standard is 100 ppm (360 mg/m^3); however, the ACGIH 1975 recommended TLV was 50 ppm (180 mg/^{3}) of technical grade.

Route of Entry: Inhalation of vapor and skin absorption.

Harmful Effects

Local—Liquid and vapor may be irritating to eyes, nose and throat.

Systemic—Exposure to dioxane vapor may cause drowsiness, dizziness, loss of appetite, headache, nausea, vomiting, stomach pain and liver and kidney damage. Prolonged skin exposure to the liquid may cause drying and cracking.

Medical Surveillance: Check for headache, dizziness and stomach disturbances; also skin and kidney and liver function.

Special Tests: No specific tests are available.

Personal Protective Methods: In areas of vapor concentration, use protective clothing, barrier creams, gloves and respirators.

Epichlorohydrin

Description: Epichlorohydrin is a colorless liquid with a chloroform like odor.

Synonyms: Epi, chloropropylene oxide, 1-chloro-2,3-epoxypropane, chloromethyloxidrane, 2-epichlorohydrin.

Potential Occupational Exposures: Epichlorohydrin is used in epoxy resins, in the preparation of paints, varnishes and lacquers and as a solvent for gums, resins and celluloses.

A Partial list of occupations in which exposure may occur includes: Lacquerers, Lacquer Makers, Paint Makers, Varnish Makers and Painters.

Permissible Exposure Limits: The Federal standard is 5 ppm (19 mg/m^3). NIOSH has recommended a time-weighted average limit of 2 mg/m^3 with a ceiling concentration of 19 mg/m^3 based on a 15-minute sampling period.

Route of Entry: Inhalation of vapor, skin absorption of liquid.

Harmful Effects

Local—Epichlorohydrin is highly irritating to eyes, skin and respiratory tract. Skin contact may result in delayed blistering and deep-seated pain. Allergic contact dermatitis occurs occasionally.

Systemic—The earliest symptoms of intoxication are nausea, vomiting, abdominal discomfort or pain in the region of the liver. Labored breathing, cough and skin discoloration may be evident and the onset of chemical pneumonitis may occur several hours after exposure. Animals exposed repeatedly to this chemical have developed lung, kidney and liver injury.

Medical Surveillance: Check the skin, eyes, lungs, liver and kidney.

Special Tests: None.

Personal Protective Methods: Goggles and protective clothing should be worn. Epichlorohydrin slowly penetrates rubber, so protective clothing should be made of material other than rubber. Respirators are required in areas of vapor concentrations.

ESTERS

There are three basic effects of esters: 1) anesthesia and primary irritation; 2) tears, blistering and lung irritation; 3) nervous system or brain damage. However, aliphatic and aromatic esters used as plasticizers are physiologically harmless.

Acetates

Description:

Methyl acetate,
Ethyl acetate,
n-Propyl acetate,
Isopropyl acetate,
n-Butyl acetate,
Amyl acetate.
The acetates are colorless, volatile, flammable liquids.

Synonyms:

Methyl acetate: none.
Ethyl acetate: acetic ether, vinegar naphtha.
n-Propyl acetate: acetic acid-propyl ester.
Isopropyl acetate: none.
n-Butyl acetate: butyl ethanoate, acetic acid butyl ester.
Amyl acetate: isoamyl acetate, pear oil, banana oil, acetate ester, pentyl acetate.

Potential Occupational Exposures: The acetates are a group of solvents for cellulose nitrate, nitrocellulose acetate, ethyl cellulose, resins, phenolics and oils and waxes. They are also used in the manufacture of lacquers, paints, varnishes and furniture polish.

A partial list of occupations in which exposure may occur includes: Lacquer Makers, Paint Makers, Varnish Makers and Painters.

Permissible Exposure Limits: The Federal standards are:

Methyl acetate, 200 ppm (610 mg/m^3);
Ethyl acetate, 400 ppm (1,400 mg/m^3);
n-Propyl acetate, 200 ppm (840 mg/m^3);
Isopropyl acetate, 250 ppm (950 mg/m^3);
n-Butyl acetate, 150 ppm (710 mg/m^3);
Isoamyl acetate, 100 ppm (525 mg/m^3);
n-Amyl acetate, 100 ppm (525 mg/m^3);
sec-Amyl acetate, 100 ppm (525 mg/m^3);
sec-Butyl acetate, 200 ppm (950 mg/m^3);
tert-Butyl acetate, 200 ppm (950 mg/m^3).

Route of Entry: Inhalation and ingestion.

Harmful Effects

Local—In higher concentrations, acetates irritate the mucous membranes, eyes and nasal passages. Prolonged exposure can cause irritation of the skin. These local effects are the primary risk in industry.

Systemic—All acetates may cause headache, drowsiness and unconsciousness if concentrations are high enough. These effects are relatively gradual in onset and slow in receding after exposure.

Medical Surveillance: Check the skin, respiratory tract and liver and kidney function.

Special Tests: None in common use.

Personal Protective Methods: Barrier creams and protective clothing with gloves should be used, as well as full facemasks in areas of vapor concentration.

Ethyl Silicate

Description: Ethyl silicate is a colorless, flammable liquid with a sharp odor detectable at 85 ppm.

Synonyms: Tetraethyl orthosilicate, tetraethoxy silane.

Potential Occupational Exposures: Ethyl silicate is used as a hardener for water- and weather-resistant finishes. It produces heat-resistant and chemical-resistant paints and coatings.

A partial list of occupations in which exposure may occur includes: Adhesive Makers, Building Coaters, Heat Resistant Paint Makers, Lacquer Makers, Silicate Paint Makers and Painters.

Permissible Exposure Limits: There is no Federal standard; however, the ACGIH recommended TLV is 100 ppm (approximately 850 mg/m^3) determined as a time-weighted average. This TLV has not been confirmed in human exposure. At 3,000 ppm, ethyl silicate vapors are intolerable.

Route of Entry: Inhalation of vapor.

Harmful Effects

Local—Ethyl silicate is a primary irritant to the eyes and the nose.

Systemic—Anemia and damage to the lungs, liver and kidneys have been observed in animal experiments but have not been reported for human exposure.

Medical Surveillance: Check the skin, eyes, respiratory tract and liver and kidney functions.

Special Tests: None currently used.

Personal Protective Methods: Full facemask respirators in areas of vapor concentration.

CARBOXYLIC ACIDS AND ANHYDRIDES

These compounds have a primary irritant effect. Some may cause severe tissue damage similar to that seen with strong mineral acids. Sensitization may also occur but is more common with the anhydrides than the acids.

Acetic Acid

Description: Acetic acid is a colorless liquid with a pungent vinegar-like odor. Glacial acetic acid contains 99% acid.

Synonyms: Ethanoic acid, ethylic acid, methane carboxylic acid, pyroligneous acid, vinegar acid.

Potential Occupational Exposures: Acetic acid is utilized in the manufacture of Paris green, white lead and stain removers.

A partial list of occupations in which exposure may occur includes: Stain Remover Makers and Users and White Lead Makers.

Permissible Exposure Limits: The Federal standard is 10 ppm (25 mg/m^3).

Route of Entry: Inhalation of vapor.

Harmful Effects

Local—Acetic acid vapor may irritate the eyes, nose, throat and lungs. Inhalation of concentrated vapors may cause serious damage to the lining membranes of the nose, throat and lungs. Contact with concentrated acetic acid may cause severe damage to the skin and to the eyes, which may result in loss of sight. Repeated or prolonged exposure to acetic acid may cause darkening and irritation of the skin, erosion of the exposed front teeth and chronic inflammation of the nose, throat and bronchi.

Systemic—Bronchopneumonia and pulmonary edema may develop following acute overexposure. Chronic exposure may result in inflammation of the pharynx and catarrhal bronchitis. Ingestion may result in penetration of the esophagus, bloody vomiting, diarrhea, shock, destruction of red blood cells and hemoglobin in the urine which is followed by kidney failure.

Medical Surveillance: Check the skin, eyes, teeth and respiratory tract.

Special Tests: None in common use.

Personal Protective Methods: Personal protective equipment, protective clothing, gloves and goggles must be worn. Eye fountains and showers should be available in areas of potential exposure.

Formic Acid

Description: Formic acid is a colorless, flammable, fuming liquid with a pungent odor.

Synonyms: Methanoic acid, formylic acid, hydrogen carboxylic acid.

Potential Occupational Exposures: Formic acid is used in the manufacture of cellulose formate, phenolic resins and oxalate.

A partial list of occupations in which exposure may occur includes Lacquer makers.

Permissible Exposure Limits: The Federal standard is 5 ppm (9 mg/m^3).

Route of Entry: Inhalation of vapor and skin absorption.

Harmful Effects

Local—Severe irritation of the skin, eyes and mucous membranes.

Systemic—Swallowing formic acid results in severe poisoning and death. The symptoms found in this type of poisoning include salivation, vomiting, burning sensation in the mouth, bloody vomiting, diarrhea and pain. In severe poisoning, shock may occur. Later, breathing difficulties may develop. Kidney damage may also be present.

Medical Surveillance: Check the skin, eyes and lungs.

Special Tests: None currently used.

Personal Protective Methods: Workers should be supplied with protective clothing, gloves and goggles. Respiratory protection is needed in areas of high vapor exposure.

ALDEHYDES AND KETONES

The aldehydes are volatile, colorless liquids, with the exception of formaldehyde which is a gas and can exhibit additional hazard due to its flammability. Typically, these compounds are strongly irritating to the skin, eyes and respiratory tract. Acute exposure may result in pulmonary injuries such as edema, bronchitis and bronchopneumonia. Skin and pulmonary sensitization may develop in some individuals and result in contact dermatitis and, more rarely, in asthmatic attacks. After hypersensitivity develops, individuals may develop symptoms due to other aldehydes. For this reason, medical surveillance and industrial hygiene practices are of importance.

Ketones are flammable, colorless liquids with a pungent odor similar to acetone. They are used as industrial solvents. Prolonged exposure is usually precluded by the intense irritation of the eyes and respiratory tract.

Acetaldehyde

Description: Acetaldehyde is a flammable, volatile, colorless liquid with a characteristic odor.

Synonyms: Acetic aldehyde, aldehyde, ethanol, ethyl aldehyde.

Potential Occupational Exposures: Acetaldehyde is used in the manufacture of lacquers, varinshes and as a solvent.

A partial list of occupations in which exposure may occur includes: Lacquerers, Varnish Makers and Lacquer Makers.

Permissible Exposure Limits: The Federal standard is 200 ppm (360 mg/m^3); however, the ACGIH 1976 recommended TLV is 100 ppm (180 mg/m^3).

Route of Entry: Inhalation of vapor.

Harmful Effects

Local—The liquid and vapor irritate the eyes, skin, upper respiratory passages and bronchi. Repeated exposure may result in dermatitis and skin sensitization.

Systemic –Acute exposure to high levels of acetaldehyde vapors may result in pulmonary edema, preceded by excitement and followed by narcosis.

Medical Surveillance: Check the skin, eyes and respiratory tract.

Special Tests: None appear needed, but effects of exposure can be determined from blood results by gas chromatographic methods, if desired.

Personal Protective Methods: Protective clothing, gloves, goggles and respiratory protective equipment in high concentrations of the gas or vapor.

Furfural

Description: Furfural has an amber color and aromatic odor.

Synonyms: Furfurol (a misnomer), furfuraldahyde, artificial ant oil, pyromucic aldehyde, furol, 2-furaldehyde.

Potential Occupational Exposures: Furfural is used as a solvent for wood resin, cellulose acetate, gums and lacquers. It is used in the production of phenolic plastics, thermosetting resins and varnishes.

A partial list of occupations in which exposure may occur includes Lacquer Workers.

Permissible Exposure Limits: Federal standard is 5 ppm (20 mg/m^3).

Routes of Entry: Inhalation of vapor, skin absorption.

Harmful Effects

Local—Liquid and concentrated vapors are irritating to the eyes, skin and mucous membranes of the upper respiratory tract. Dermatitis and skin sensitization, resulting in allergic contact dermatitis and photosensitivity, may develop following repeated exposure.

Systemic—Chronic exposure to the vapor results in headache, fatigue, itching of the throat, tears, loss of the sense of taste, numbness of the tongue and tremor. Occupational overexposure is relatively rare due to the liquid's low vapor pressure, and symptoms usually disappear rapidly after removal from exposure.

Medical Surveillance: Check skin irritation and skin allergies (especially to aldehydes). Also check respiratory irritant effects.

Special Tests: None commonly used.

Personal Protective Methods: Protective clothing and adequate ventilation should be provided in areas where exposure may occur. In areas of vapor concentrations, full facemask respirators may be required.

Ketones

Description: The ketone family includes: acetone, diacetone, methyl ethyl ketone, methyl n-propyl, methyl n-butyl ketone and methyl isobutyl ketone.

Synonyms: Acetone: 2-Propanone, dimethyl ketone, beta-ketopropane, pyroacetic ether.

Diacetone: Diacetone alcohol, diacetonyl alcohol, dimethylacetonyl carbinol, 4-hydroxy-4 methyl-2-pentanone, 2-methyl-2-pentanol-4-one.

Methyl ethyl ketone: Butanone, 2-butanone, MEK, ethyl methyl ketone.

Methyl n-propyl ketone: Ethyl acetone, 2-pentanone, MPK.

Methyl n-butyl ketone: n-Butyl methyl ketone, propyl acetone, 2-hexanone, MBK.

Methyl isobutyl ketone: Hexone, isopropylacetone, 4-methyl-2-pentanone, MIBK.

Potential Occupational Exposures: Ketones are low-cost solvents for resins, lacquers, oils, cellulose acetate, nitrocellulose, cellulose esters, epoxy resins, pigments, polymers, copolymers und varnishes. They are used as chemical intermediates in the paint, lacquer and varnish. They are also used as paint removers.

A partial list of occupations in which exposure may occur includes: Lacquer and Oil Processors, Varnish and Stain Makers, Paint Makers, Painters and Lacquerers.

Permissible Exposure Limits: The Federal standards are: Acetone, 1,000 ppm (2,400 mg/m^3); Diacetone, 50 ppm (240 mg/m^3); Methyl ethyl ketone, 200 ppm (590 mg/m^3); Methyl n-propyl ketone, 200 ppm (700 mg/m^3); Methyl n-butyl ketone, 100 ppm (410 mg/m^3); and Methyl isobutyl ketone, 100 ppm (410 mg/m^3).

Routes of Entry: Inhalation of vapor, skin absorption.

Harmful Effects

Local—These solvents may produce a dry, scaly and fissured dermatitis after repeated exposure. High vapor concentrations may irritate the eyes and mucous membranes of the nose and throat.

Systemic—In high concentrations, narcosis is produced with symptoms of headache, nausea, light headedness, vomiting, dizziness, loss of coordination and unconsciousness.

Recent reports indicate that exposure of workers to methyl n-butyl ketone has been associated with degeneration of the peripheral nerves.

Medical Surveillance: Check the skin and respiratory conditions. In the case of methyl n-butyl ketone, special attention should be given to the central and peripheral nervous systems.

Special Tests: Blood, urine and expired air.

Personal Protective Methods: Contact with skin and eyes is avoided by the use of protective clothing. In areas of high vapor concentration, respirators are used.

ALIPHATIC HALOGENATED HYDROCARBONS

Halogenated hydrocarbons typically are colorless, volatile liquids.

Halogenated hydrocarbons have found wide use as solvents.

Most halogenated hydrocarbons cause central nervous system depression and dermatitis. Inhalation of high concentrations of vapor can cause liver or kidney injury, but it should be noted that while some compounds may have no effect, others may affect only one of these two organs, and still others may affect both. Lung irritation and damage to the blood-producing system may also occur after exposure to certain compounds.

Medical surveillance of workers exposed to halogenated hydrocarbons should include periodic examinations, including urinalysis to check for kidney damage and appropriate tests for liver dysfunction. Evidence of acute exposure to chlorinated compounds may be obtained in some cases by analysis of expired air obtained soon after exposure.

Carbon Tetrachloride

Description: Carbon tetrachloride is a colorless, nonflammable liquid with a characteristic odor. Decomposition by flame causes phosgene and hydrogen chloride to form.

Synonyms: Tetrachloromethane, perchloromethane.

Potential Occupational Exposures: Carbon tetrachloride is used as a solvent for oils, fats, lacquers, varnishes, rubber, waxes and resins. It is also used as a fire extinguishing agent. The use of this solvent is widespread, and substitution of less toxic solvents when technically possible is *recommended*.

A partial list of occupations in which exposure may occur includes: Lacquer Makers, Painters and Paint Makers.

Permissible Exposure Limits: The Federal standard is 10 ppm (65 mg/m^3) as an eight-hour TWA with an acceptable ceiling concentration of 25 ppm; acceptable maximum peaks above the ceiling of 200 ppm are allowed for one five-minute duration in any four-hour period. NIOSH has recommended a ceiling limit of 2 ppm based on a one-hour sampling period at a rate of 750 ml/min.

Routes of Entry: Inhalation of vapor. Skin absorption has been demonstrated in animals.

Harmful Effects

Local—Carbon tetrachloride removes the natural fat cover of the skin. Repeated contact may lead to dermatitis. Eye contact is slightly irritating, but this condition is temporary.

Systemic—Excessive exposure may result in central nervous system depression and stomach and intestinal symptoms. Following acute exposure, signs and symptoms of liver and kidney damage may develop. Nausea, vomiting, abdominal pain, diarrhea, enlarged and tender liver and jaundice result from toxic hepatitis. Diminished urinary volume, red and white blood cells in the urine, protein in the urine, coma and death may be consequences of acute kidney failure. The hazard of systemic effects is increased when carbon tetrachloride is used in conjunction with ingested alcohol.

Medical Surveillance: Check the alcohol intake and liver and kidney functions. Special attention should be given to the central and peripheral nervous system and the skin and blood.

Special Tests: Expired air and blood levels may be useful as indicators of exposure.

Personal Protective Methods: Barrier creams, gloves, protective clothing and respirators are used as appropriate where exposure occurs.

Chloroform

Description: Chloroform is a clear, colorless liquid with a characteristic odor. Though nonflammable, chloroform decomposes to form hydrochloric acid, phosgene and chlorine upon contact with a flame.

Synonyms: Trichloromethane, methenyl chloride.

Potential Occupational Exposures: Chloroform is widely used as a solvent (especially in the lacquer industry) in the manufacture of floor polishes.

A partial list of occupations in which exposure may occur includes: Lacquer Workers.

Permissible Exposure Limits: The Federal standard is 50 ppm (240 mg/m^3). The ACGIH recommended 1976 TLV is 25 ppm. NIOSH's recommended limit is a ceiling of 2 ppm based on a one-hour sample collected at 750 liters per minute.

Route of Entry: Inhalation of vapors.

Harmful Effects

Local—Chloroform may produce burns if left in contact with the skin.

Systemic—Chloroform is a relative potent anesthetic at high concentrations. Death from its use has resulted from liver damage and from cardiac arrest. Exposure may cause exhaustion, digestive disturbances, dizziness, mental dullness and coma. Chronic overexposure has been shown to cause enlargement of the liver and kidney damage. Alcoholics seem to be affected sooner and more severely from chloroform exposure. Disturbance of the liver is more characteristic of exposure than central nervous system depression or kidney injury. There is some animal experimental evidence that suggests chloroform may be a carcinogen.

Medical Surveillance: Check liver and kidney functions and give special attention to the nervous system, the skin and to history of alcoholism.

Special Tests: Expired air and blood levels.

Personal Protective Methods: Protective clothing and gloves protect the skin, and masks are worn in areas of high vapor concentration.

1,2-Dibromoethane

Description: 1,2-Dibromoethane is a colorless nonflammable liquid with a chloroform like odor.

Synonyms: Ethylene dibromide, ethylene bromide, sum-dibromoethane.

Potential Occupational Exposures: 1,2-Dibromoethane is used in waterproofing preparations, and it is used as a solvent for celluloid, fats, oils and waxes. It is also used as an insecticide in coatings.

A partial list of occupations in which exposure may occur includes: Painters and Paint Makers.

Permissible Exposure Limits: The Federal standard is 20 ppm (145 mg/m^3) as an 8-hour TWA with an acceptable ceiling concentration of 300 ppm; acceptable maximum peaks above the ceiling of 50 ppm are allowed for five minutes duration.

Routes of Entry: Inhalation of the vapor and skin absorption.

Harmful Effects

Local—Prolonged contact of the liquid with the skin may cause redness, blistering and skin ulcers. These reactions may be delayed 24-48 hours. Skin sensitization to the liquid may develop. The vapor is irritating to the eyes and the respiratory tract.

Systemic—Inhalation of the vapor may result in severe acute respiratory injury, central nervous system depression and severe vomiting. Animal experiments have produced injury to the liver and kidneys. 1,2-Dibromoethane may be a human carcinogen.

Medical Surveillance: Check the skin, eyes, respiratory tract and liver and kidneys.

Special Tests: None commonly used.

Personal Protective Methods: 1,2-Dibromoethane can penetrate most types of rubber and leather protective clothing, and protective clothing made from other materials should be provided. Respirators must be worn in areas with excessive vapor concentrations.

1,2-Dichloroethane

Description: 1,2-Dichloroethane is a colorless, flammable liquid with a pleasant odor, sweetish taste.

Synonyms: Ethylene dichloride, sym-dichloroethane, ethylene chloride, glycol dichloride, beta-dichloroethane.

Potential Occupational Exposures: 1,2-Dichloroethane is a solvent for resins, asphalt, bitumen, rubber, cellulose acetate, cellulose ester and paint. It has found use in the production of adhesives and varnishes.

A partial list of occupations in which exposure may occur includes: Paint Makers and Painters.

Permissible Exposure Limits: The Federal standard is 50 ppm (200 mg/m^3) as an 8-hour TWA with an acceptable ceiling concentration of 100 ppm. Acceptable maximum peaks above the ceiling of 200 ppm are allowed for five minutes duration in any three-hour period.

Routes of Entry: Inhalation of vapor and skin absorption of liquid.

Harmful Effects

Local—Repeated contact with liquid can produce dermatitis. Liquid and vapor may also cause eye damage.

Systemic—Inhalation of high concentrations may cause nausea, vomiting, mental confusion, dizziness and pulmonary edema. Chronic exposure has been associated with liver and kidney damage.

Medical Surveillance: Check the skin and liver and kidney functions.

Special Tests: None commonly used; can be determined in expired air.

Personal Protective Methods: Protective clothing, goggles and gloves are to be worn. In high vapor concentrations, use full facemasks and supplied-air respirators.

1,2-Dichloroethylene

Description: At room temperature, 1,2-Dichloroethylene is a liquid with a slight acrid, ethereal odor. Gradual decomposition results in hydrochloric acid formation in the presence of ultraviolet light or upon contact with hot metal.

Synonyms: Acetylene dichloride, sym-dichloroethylene, 1,2-dichloroethene.

Potential Occupational Exposures: 1,2-Dichloroethylene is used as a solvent for waxes, resins and acetyl cellulose.

A parital list of occupations in which exposure may occur includes: Paint Makers and Painters.

Permissible Exposure Limits: Federal standard is 200 ppm (790 mg/m^3).

Route of Entry: Inhalation of the vapor.

Harmful Effects

Local—The liquid produces dermatitis and irritates the mucous membranes.

Systemic—1,2-Dichloroethylene is a narcotic, causing central nervous system depression. Symptoms of acute exposure include dizziness, nausea and frequent vomiting and central nervous system intoxication similar to that caused by alcohol. Kidney effects, when they do occur, are temporary.

Medical Surveillance: Check the skin, respiratory tract and liver and kidney functions.

Special Tests: None commonly used; expired air analyses may be useful in detecting exposure.

Personal Protective Methods: Barrier creams and gloves are needed to protect the skin. In high vapor

concentrations, respirators and protective clothing are required.

Methyl Bromide

Description: Methyl bromide is a colorless, nearly odorless gas.

Synonyms: Bromomethane.

Potential Occupational Exposures: Methyl bromide is used as an insecticide and herbicide in paint and other coverings.

A partial list of occupations in which exposure may occur includes: Paint Makers and Painters.

Permissible Exposure Limits: Federal standard for methyl bromide is 20 ppm (80 mg/m^3) as a ceiling value. The ACGIH recommended TLV for methyl bromide is 15 ppm (60 mg/m^3) as a TWA.

Routes of Entry: Inhalation and skin absorption.

Harmful Effects

Local—Methyl bromide irritates the eyes, skin and mucous membranes of the upper respiratory tract. In cases of moderate skin exposure, there may be an itching dermatitis and, in severe cases, vesicles and second-degree burns. Methyl bromide may be absorbed by leather, resulting in prolonged skin contact.

Systemic—High concentrations of methyl bromide may cause lung irritation which can result in pulmonary edema and death. Acute exposure to methyl bromide may produce delayed effects. Onset of symptoms is usually delayed from 30 minutes to 6 hours; the first to appear are discomfort, visual disturbances, headaches, nausea, vomiting, sleeplessness, disorientation and tremor in the hands. The tremor may become more severe and widespread, developing into epileptic-like convulsions followed by coma and death due to pulmonary or circulatory failure or both. A period of delirium and mania may precede convulsions, but convulsions have been reported without any other warning symptoms. Kidney damage and permanent brain damage may result.

In chronic poisoning, the effects of methyl bromide are usually limited to the central nervous system: stupor; muscular pains; visual, speech and sensory disturbances; and mental confusion being the most prominent complaints.

Medical Surveillance: Check the central nervous system, respiratory tract and skin.

Special Tests: None in common use. Blood bromide levels have been measured in cases of methyl bromide intoxication, but their value in routine monitoring of exposure has not been established.

Personal Protective Methods: Rubber, not leather, protective clothing should be utilized. When respirators are worn, they should provide full face protection.

Methylene Chloride

Description: Methylene chloride is a nonflammable, colorless liquid with a pleasant aromatic odor noticeable at 300 ppm. (This should not be relied upon as an adequate warning of unsafe concentrations.)

Synonyms: Dichloromethane, methylene dichloride, methylene bichloride.

Potential Occupational Exposures: Methylene chloride is used as a solvent for oil, waxes, cellulose acetate and esters. It is also used as a paint remover.

A partial list of occupations in which exposure may occur includes: Paint Remover Makers, Floorcoverers, Painters and Paint Makers.

Permissible Exposure Limits: The Federal standard is 500 ppm (1,740 mg/m^3) as an eight-hour TWA with an acceptable ceiling concentration of 1,000 ppm; acceptable maximum peaks above the ceiling of 2,000 ppm are allowed for five minutes' duration in a two-hour period.

Note: The 1976 ACGIH TLV is 200 ppm (720 mg/m^3).

NIOSH has recommended a time-weighted average limit of 75 ppm in the absence of occupational exposure to carbon monoxide greater than 9 ppm (TWA). For carbon monoxide exposures greater than 9 ppm, a formula is recommended. NIOSH also recommended a ceiling limit of 500 ppm as determined by a 15-minute sampling period.

Routes of Entry: Inhalation of vapors and skin absorption of liquid.

Harmful Effects

Local—Repeated contact with methylene chloride may cause dermatitis. The liquid and vapor are irritating to the eyes and upper respiratory tract. If the liquid is held in contact with the skin, it may cause skin burns.

Systemic—Methylene chloride is a mild narcotic. Effects from intoxication include headache, giddiness, stupor, irritability, numbness and tingling in the limbs. Irritation to the eyes and upper respiratory passages occurs at higher dosages. In severe cases, observers have noted toxic brain dysfunction with hallucinations, pulmonary edema, coma and death. Exposure to this agent may cause elevated carboxyhemoglobin levels which may be significant in smokers, or workers with anemia or heart disease, and those exposed to CO.

Medical Surveillance: Check the liver, respiratory tract and central nervous system. Smoking history should be known; anemias or cardiovascular disease may increase the hazard.

Special Tests: Blood and expired air. Carboxyhemoglobin levels may be useful indicators of excessive exposure, especially in non-smokers.

Tetrachloroethane

Description: Tetrachloroethane is a heavy, volatile liquid which is nonflammable and has a sweetish, chloroform-like odor. Decomposition of tetrachloroethane by ultraviolet radiation or by contact with hot metal results in the formation of small quantities of phosgene, hydrochloric acid, carbon monoxide, carbon dioxide or dichloroacetyl chloride.

Synonyms: 1,1,2,2-Tetrachloroethane, sym-tetrachloroethane, acetylene tetrachloride, ethanetetrachloride.

Potential Occupational Exposures: Tetrachloroethane is used as a fumigant and solvent in lacquers. Recently, its use as a solvent has declined due to replacement by less toxic compounds.

A partial list of occupations in which exposure may occur includes: Lacquer Workers, Paint Makers, Painters and Varnish Workers.

Permissible Exposure Limits: Federal standard is 5 ppm (35 mg/m^3). NIOSH has recommended a time-weighted average limit of 1 ppm.

Routes of Entry: Inhalation of vapor and skin absorption of the liquid. There is some evidence that tetrachloroethane absorbed through the skin affects the central nervous system only.

Harmful Effects

Local—Repeated or prolonged contact with this chemical can produce dermatitis.

Systemic—Early effects brought on by tetrachloroethane narcotic action include tremors, headache, a prickling sensation and numbness of limbs, loss of kneejerk and excessive sweating. Paralysis of muscles of the hands and feet and disappearance of eye and pharynax reflexes have also occurred. Blood changes may also result.

Clinical symptoms following these changes are fatigue, headache, constipation, insomnia, irritability and nausea. Later on, liver dysfunction may cause complaints of general discomfort, drowsiness, loss of appetite, nausea, an unpleasant taste in the mouth and abdominal discomfort. This may be followed by jaundice, mental confusion, stupor or delirium, convulsions and rashes.

Pulmonary edema has been noted in severe cases, along with kidney damage, though it is not known to what extent this contributes to the total toxic picture. The urine may contain protein and casts.

Medical Surveillance: Special attention should be given to liver, kidney and bone marrow function and the central and peripheral nervous systems. Alcoholism may be a predisposing factor.

Special Tests: None commonly used. Blood or breath analyses may be useful.

Personal Protective Methods: Gloves and protective clothing are worn, and appropriate respirators in areas of elevated vapor concentration.

Tetrachloroethylene

Description: Tetrachloroethylene is a clear, colorless, nonflammable liquid with a characteristic odor. The odor is noticeable at 50 ppm, though after a short period it may become inconspicuous, thereby becoming an unreliable warning signal.

Synoyms: Perchloroethylene, carbon dichloride, ethylene tetrachloride.

Potential Occupational Exposures: Tetrachloroethylene is a widely used solvent for fats, oils, resins and cellulose acetate and as a fumigant.

A partial list of occupations in which exposure may occur includes: Paint Makers and Painters.

Permissible Exposure Limits: The Federal standard is 100 ppm (670 mg/m^3), as an eight-hour TWA with an acceptable ceiling concentration of 200 ppm; acceptable maximum peaks above the ceiling of 300 ppm are allowed for five minutes duration in a three-hour period. NIOSH has recommended a time-weighted average limit of 50 ppm and a ceiling limit of 100 ppm determined by 15-minute samples, twice daily.

Routes of Entry: Inhalation of vapor and skin absorption of liquid.

Harmful Effects

Local—Repeated contact may cause dermatitis and eye and nose irritation.

Systemic—Acute exposure to tetrachloroethylene may cause central nervous system depression, liver injury and anesthetic death. Irregular heart beat and kidney injury have been produced in animal experiments. Signs and symptoms of overexposure include discomfort, dizziness, headache, increased perspiration, fatigue, staggering gait and slowing of mental ability. These usually subside quickly upon removal into the open air.

Medical Surveillance: Check the skin, and liver and kidney function and the central nervous system. Alcoholism may be a predisposing factor.

Special Tests: Breath analyses may be helpful in evaluating exposure. Workers with preemployment histories of liver, kidney or nervous disorders should be advised as to possible increased risk.

Personal Protective Methods: Skin protection in the form of barrier creams, gloves and protective clothing should be used. In areas of vapor concentration, full facemask respirators should be worn.

1,1,1-Trichloroethane

Description: 1,1,1-Trichloroethane is a colorless, nonflammable liquid with an odor similar to chloroform. Upon contact with hot metal or exposure to ultraviolet radiation, it will decompose to form the irritant gases hydrochloric acid, phosgene and dichloroacetylene.

Synonyms: Methyl chloroform.

Potential Occupational Exposures: In recent years, 1,1,1-trichloroethane has found wide use as a substitute for carbon tetrachloride.

A partial list of occupations in which exposure may occur includes: Stain Remover Makers.

Permissible Exposure Limits: The Federal standard is 350 ppm (1,900 mg/m^3). NIOSH has recommended a 350 ppm ceiling as determined by a 15-minute sampling period.

Routes of Entry: Inhalation of vapor and moderate skin absorption.

Harmful Effects

Local—Liquid and vapor are irritating to eyes on contact. Mild eye irritation may develop but recovery is usually rapid. Repeated skin contact may produce dermatitis.

Systemic—1,1,1-Trichloroethane acts as a narcotic and depresses the central nervous system. Acute exposure symptoms include dizziness, loss of coordination, drowsiness, increased reaction time, unconsciousness and death.

Medical Surveillance: Check the skin, liver function, cardiac status, especially irregular heart beat.

Special Tests: Expired air analyses may be useful in monitoring exposure.

Personal Protective Methods: 1,1,1-Trichloroethane attacks natural rubber; therefore, protective clothing of leather or polyvinyl alcohol is recommended. In areas of high concentrations, full facemask respirators should be worn.

Trichloroethylene

Description: Trichloroethylene is a colorless, nonflammable, noncorrosive liquid that has the "sweet" odor characteristic of some chlorinated hydrocarbons. Decomposition of trichloroethylene, due to contact with hot metal or ultraviolet radiation, forms products including chlorine gas, hydrogen chloride and phosgene.

Synonyms: Ethylene trichloride, ethinyl trichloride, trichloroethane, trike.

Potential Occupational Exposures: Trichloroethylene is used as a solvent in the production of gums, resins, tars, paints and varnishes.

A partial list of occupaitons in which exposure may occur includes: Floorcoverers, Paint Makers, Painters and Varnish Workers.

Permissible Exposures Limits: The Federal standard is 100 ppm (535 mg/m^3) as an eight-hour TWA with an acceptable ceiling concentration of 200 ppm; acceptable maximum peaks above the ceiling of 300 ppm are allowed for five minutes duration in a two-hour period. The NIOSH Criteria for a Recommended Standard recommends limits of 100 ppm as a TWA and a peak of 150 ppm determined by a sampling time of 10 minutes.

Routes of Entry: Inhalation and skin absorption.

Harmful Effects

Local—Exposure to trichloroethylene vapor may couse irritation of the eyes, nose and throat. The liquid, if splashed in the eyes, may cause burning irritation and damage. Repeated or prolonged skin contact with the liquid may cause dermatitis.

Systemic—Acute exposure to trichloroethylene depresses the central nervous system, creating such symptoms as headache, dizziness, tremors, nausea and vomiting, irregular heart beat, sleepiness, fatigue, blurred vision and intoxication similar to that of alcohol. Unconsciousness and death have been reported. Alcohol may make the symptoms of trichloroethylene overexposure worse. If alcohol has been consumed, the overexposed worker may become flushed. Trichloroethylene addiction and nerve disease have been reported. Recent reports indicate that exposure to trichloroethylene may induce liver tumors in mice.

Medical Surveillance: Check the skin, respiratory, cardiac, central and peripheral nervous systems as well as liver and kidney function. Alcohol intake should be evaluated.

Special Tests: Expired air analysis and urinary metabolites have been used to monitor exposure.

Personal Protective Methods: Gloves and protective clothing are worn and full facemask respirators used in areas of excessive vapor concentrations.

Vinyl Chloride

Description: Vinyl chloride is a flammable gas at room temperature and is usually encountered as a cooled liquid. The colorless liquid forms a vapor which has a pleasant ethereal odor.

Synonyms: Chloroethylene, chloroethene, monochloroethylene.

Potential Occupational Exposures: Vinyl chloride is used in the manufacture of polyvinyl chloride and other resins. It is also used as a solvent.

A partial list of occupations in which exposure may occur includes: Wallcoverers.

Permissible Exposure Limits: The Federal standard for exposure to vinyl chloride sets a limit of 1 ppm over an eight-hour period, and a ceiling of 5 ppm averaged over any period not exceeding 15 minutes.

Routes of Entry: Vinyl chloride gas is absorbed by inhalation. Skin absorption has been suggested but experimental evidence is presently lacking.

Harmful Effects

Local—Vinyl chloride is a skin irritant, and contact with the liquid may cause frostbite upon evaporation. The eyes may be immediately and severely irritated.

Systemic—Vinyl chloride depresses the central nervous system causing symptoms which resemble mild alcohol intoxication. Light headedness, some nausea and dulling of visual and auditory responses may develop in acute exposures. Death from severe vinyl chloride exposure has been reported.

Chronic exposure may also cause kidney damage.

Vinyl chloride is regarded as a human carcinogen, and a causal agent of liver cancer. Cancer of the lung and the lymphatic and nervous systems has also been reported. Experimental evidence of tumor induction in a variety of organs, including liver, lung and connective tissue deterioration, indicate the multisystem

tumor development and toxicologic effects of vinyl chloride.

Medical Surveillance: Check liver function and palpation. Liver scans and grey-scale ultrasonography have been useful in detecting liver tumors. Medical histories should include alcoholic intake; past hepatitis; exposure to hepatotoxic agents, drugs and chemicals; past blood transfusions; past hospitalizations. Radiographic examinations of the hands may be helpful if acroosteolysis is suspected. Long-term follow-up of exposed persons is essential as in the case of other carcinogens.

Special Tests: None in common use. Metabolism is being studied.

Personal Protective Methods: Where vinyl chloride levels cannot meet the standard, workers wear respiratory protection, either air supplied respirator or, if the level does not exceed 25 ppm, a chemical cartridge or cannister type gas mask. In hazard areas, proper protective clothing to prevent skin contact with the vinyl chloride or polyvinyl chloride residue is worn.

Isocyanates

Description: Both toluene diisocyanate (TDI) and methylene bisphenyl isocyanate (MDI) are liquids.

Synonyms: Toluene diisocyanate: TDI, tolylene diisocyanate, diisocyanatotoluene.

Methylene bisphenyl isocyanate: MDI, diphenylmethane diisocyanate, methane diisocyanate.

Potential Occupational Exposures: TDI is more widely used than MDI. These resins can be produced with various physical properties, e.g., hard, flexible, semirigid foams; and have found many uses, e.g., surface coatings, and in rubbers, adhesives, paints and textile finishes. Because of TDI's high volatility, exposure can occur in all phases of its manufacture and use. MDI has a much lower volatility and problems generally arise only in spray applications.

A partial list of occupations in which exposure may occur includes: Adhesive Workers, Lacquer Workers, Floorcoverers and Paint Sprayers.

Permissible Exposure Limits: The Federal standard for MDI is 0.02 ppm (0.2 mg/m^3) as a ceiling value. The Federal standard for TDI is also 0.02 ppm (0.14 mg/m^3) as a ceiling value. However, the standard recommended in the NIOSH Criteria Document for TDI is 0.005 ppm (0.036 mg/m^3) as a TWA and 0.02 for any 20-minute period.

Route of Entry: Inhalation of vapor.

Harmful Effects

Local—TDI and MDI may cause irritation of the eyes, respiratory tract and skin. The irritation may be severe enough to produce bronchitis and pulmonary edema. Nausea, vomiting and abdominal pain may occur. If liquid TDI is allowed to remain in contact with the skin, it may produce redness, swelling and blistering. Contact of liquid TDI with the eyes may cause severe irritation, which may result in permanent damage if untreated. Swallowing TDI may cause burns of the mouth and stomach.

Systemic—Sensitization to TDI and MDI may occur, which may cause an asthmatic reaction with wheezing, shortness of breath and cough. These symptoms may first occur during the night following exposure to these chemicals. Some decreases in lung function in the absence of symptoms has been observed in some workers exposed to TDI for long periods of time.

Medical Surveillance: Examinations should include chest roentgenograph, pulmonary function tests and an evaluation of any respiratory disease or history of allergy. Periodic pulmonary function tests may be useful in detecting the onset of pulmonary sensitization.

Special Tests: None in common use.

Personal Protective Methods: Protective clothing and goggles are worn if there is a possibility of contact with the liquids. In areas of vapor concentration, respirators with supplied air and full facepieces are worn.

AROMATIC HYDROCARBONS

Aromatic hydrocarbons are widely used as solvents. Benzene, the typical aromatic hydrocarbon has been replaced as a commercial solvent by toluene and other less toxic compounds. These chemicals are also used in the manufacture of plastics, resins and polyesters.

Typically, the vapor of aromatic hydrocarbons causes central nervous system depression or other effects, and, depending on the compound, liver, kidney or bone marrow disorders. Vapor is absorped through the lungs and the liquid may be absorbed through the skin. Repeated and prolonged skin contact may cause defatting of the skin, which leads to dermatitis.

Benzene

Description: Benzene is a clear, volatile, colorless, highly flammable liquid with a characteristic odor. The most common commercial grade contains 50-100% benzene, the remainder consisting of toluene, xylene and other constituents.

Synonyms: Benzol, phenyl hydride, coal naphtha, phene, benxole, cyclohexatriene.

Potential Occupational Exposures: Benzene is used as a solvent for fats, oils, paints, plastics and rubber. It is a major solvent for rubber-based, plastic-based, lacquer and varnish-based paints. It is also used as a solvent for adhesives and glues.

A partial list of occupations in which exposure occur includes: Floorcoverers, Painters and Paint Makers.

Permissible Exposure Limits: The Federal emergency standard for benzene effective May 21, 1977, is 1 ppm for an eight-hour TWA, with 5 ppm as a maxi-

mum peak above the acceptable ceiling for a maximum duration of 15 minutes.

Routes of Entry: Inhalation of vapor which may be supplemented by skin absorption although benzene is poorly absorbed through intact skin.

Harmful Effects

Local—Exposure to liquid and vapor may produce primary irritation to skin, eyes and upper respiratory tract. If the liquid is aspirated into the lung, it may cause pulmonary edema and hemorrhage. Dermatitis may also develop from defatting of the skin.

Systemic—Acute exposure to benzene results in central nervous system depression, headache, dizziness, nausea, convulsions, coma and death.

Chronic exposure to benzene is well documented to cause blood changes, including anemia and bone marrow disease. Red blood cells, white blood cells and platelets counts may first increase, and then anemia may develop.

Recent epidemiologic studies along with case reports of benzene-related blood diseases and chromosomal changes have led NIOSH to conclude that benzene causes leukemia.

Recent work has shown increases in the rate of chromosomal changes associated with bone marrow disease. These changes in the bone marrow may occur several years after exposure to benzene has ceased.

Medical Surveillance: Check the blood and bone marrow and history of exposure to other bone marrow disease agents or drugs or of other diseases of the blood. Laboratory exams should include: (a) complete blood count, (b) reticulocyte count, (c) serum bilirubin, and (d) urinary phenol.

The type and frequency of periodic blood studies should be related to the data obtained from biologic monitoring and industrial hygiene studies, as well as any symptoms or signs of blood effects. Recommendations for proposed examinations have been made in the criteria for a recommended standard. Examinations should also be concerned with other possible effects such as those on the skin, central nervous system and liver and kidney functions.

Special Tests: Biologic monitoring should be provided to all workers subject to benzene exposure. It consists of sampling and analysis of urine for total phenol content. The objective of such monitoring is to be certain that no worker absorbs an unacceptable amount of benzene. Poisoning is considered to occur at levels of 75 mg phenol per liter of urine (with urine specific gravity corrected to 1.024), when measured by methods specified in the NIOSH "Criteria for Recommended Standard—Benzene." Alternative methods shown to be equivalent in accuracy and precision may also be useful. Biological monitoring should be done at quarterly intervals. If environmental sampling and analysis are equal to or exceed accepted safe limits, the urinary phenol analysis should be conducted every two weeks. This increased monitoring frequency should continue for at least two months after the high environmental level has been demonstrated.

Two follow-up urines should be obtained within one week after receipt of the original results, one at the beginning and the other at the end of the work week. If original elevated findings are confirmed, immediate steps should be taken to reduce the worker's absorption of benzene by improvement in environmental control, personal protection, personal hygiene and administrative control.

Personal Protective Methods: Protective clothing is worn at all times; benzene-wetted clothing is changed at once. Impervious clothing and gloves to cover exposed areas of body are worn where exposure is continuous. In areas where there is likelihood of spill or splash, face shields or goggles are provided. In areas of elevated vapor concentration, organic vapor cartridge respirators or supplied air or self-contained breathing apparatus may be required.

Styrene/Ethyl Benzene

Description: Styrene is a colorless, oily liquid with a penetrating odor.

Ethyl benzene is a colorless flammable liquid with a pungent odor.

Synonyms: Styrene: Cinnamene, cinnemenol, cinnamol, phehethylene, phenylethylene, styrene monomer, styrol, styrolene, vinyl benzene.

Ethyl benzene: Ethylbenzol, phenylethane, EB.

Permissible Exposure Limits: The Federal standard for styrene for an eight-hour TWA is 100 ppm (420 mg/m^3). The acceptable ceiling concentration is 200 ppm with an acceptable maximum peak of 600 ppm for a maximum duration of five minutes in any three hours. The Federal standard for ethyl benzene is 100 ppm (435 mg/m^3).

Routes of Entry: Inhalation of vapor; skin absorption.

Local—Liquid and vapor are irritating of the eyes, nose, throat, and skin. Repeated contact may produce dermatitis.

Systemic—Acute exposure to high concentrations may produce irritations of the mucous membranes of the upper respiratory tract, nose and mouth, followed by symptoms of narcosis, cramps and death due to respiratory center paralysis. Effects of short-term exposure to styrene under laboratory conditions include prolonged reaction time and decreased manual dexterity.

Medical Surveillance: Check the skin, eyes and respiratory tract, blood and liver and kidney function.

Special Tests: None in common use. Mandelic acid in urine has been used as a measure of the intensity of styrene exposure.

Personal Protective Methods: Barrier creams or gloves and protective clothing may be all that are needed where the vapor concentrations do not exceed existing standards. Where vapor concentration exists above allowable standards, respirators with organic

1.8

vapor canisters and faceplates or respirators with air supply are recommended. Clothing saturated with styrene or ethylbenzene is changed at once. Personal hygiene is encouraged with frequent changes of work clothes.

Toluene

Description: Toluene is a clear, colorless, noncorrosive liquid with a sweet, pungent, benzene-like odor.

Synonyms: Toluol, methylbenzene, phenylmethane, methylbenzol.

Potential Occupational Exposures: Toluene is a thinner for paint varnishes, lacquers and enamels. It is also used as a solvent for gums, fats and resins and as a paint remover.

A partial list of occupations in which exposure may occur includes: Floorcovers, Lacquer Workers, Paint Makers and Painters.

Permissible Exposure Limits: The Federal standard is 200 ppm as an eight-hour TWA with an acceptable ceiling concentration of 300 ppm; acceptable maximum peaks above the ceiling of 500 ppm are allowed for 10 minutes duration. NIOSH has recommended a limit of 100 ppm (TWA) with a ceiling of 200 ppm for a ten minute sampling period.

Routes of Entry: Inhalation of vapor and skin absorption of liquid.

Harmful Effects

Local—Toluene may cause irritation of the eyes, respiratory tract and skin. Repeated or prolonged contact with liquid may cause dermatitis. Liquid splashed in the eyes may cause irritation and reversible damage.

Systemic—Acute exposure to toluene most often causes central nervous system depression. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness, loss of coordination with staggering gait, numbing and prickling skin, collapse and coma.

Medical Surveillance: Check the skin, central nervous system and liver and kidney function. Blood studies should also be done if there is significant contamination of the solvent with benzene.

Special Tests: Hippuric acid levels above 5 g/liter of urine may result from exposure greater than 200 ppm determined as a TWA. Blood levels can also be determined for toluene.

Personal Protective Methods: Where vapor concentration exists above allowable standards, employees are provided with respirators (air-supplied) or organic vapor respirators and full faceplate. Impervious clothing, gloves or other coverings to protect potentially exposed areas of the body is supplied to employees in operations requiring continued exposure to liquid toluene. Toluene-wet clothing is removed immediately. Safety glasses or goggles are worn in areas where splash or spill is likely.

Xylene

Synonyms: Xylol, dimethylbenzene.

Potential Occupational Exposures: Xylene is used as a solvent for gums, resins, castor oil, linseed oil; as a constituent of paint, lacquers, varnishes, adhesives, cements, epoxy resins.

A partial list of occupations which exposure may occur includes: Adhesive workers, Floorcovers, Lacquer Workers, Paint Workers and Varnish Makers.

Permissible Exposure Limits: The Federal standard is 100 ppm (435 mg/m^3).

Routes of Entry: Inhalation of vapor and, to a small extent, skin absorption of liquid.

Harmful Effects

Local—Xylene vapor may cause irritation of the eyes, nose and throat. Repeated or prolonged skin contact with xylene may cause dermatitis. Liquid xylene is irritating to the eyes and mucous membranes and breathing in of small amounts of mists may cause chemical pneumonitis, pulmonary edema and hemorrhage. Repeated exposure of the eyes to high concentrations of xylene vapor may cause reversible eye damage.

Systemic—Acute exposure to xylene vapor may cause central nervous system depression and minor reversible effects upon liver and kidneys. At high concentrations xylene vapor may cause dizziness, staggering, drowsiness and unconsciousness. Also at very high concentrations, breathing xylene vapors may cause pulmonary edema, loss of appetite, nausea, vomiting and abdominal pain.

Medical Surveillance: Check the skin, central nervous system and liver and kidney functions. Blood studies should be done if there is any significant contamination of the solvent with benzene.

Special Tests: Although metabolites are known, biologic monitoring has not been widely used. Hippuric acid or the ether glucuronide of ortho-toluic acid may be useful in diagnosis of xylene exposure.

Personal Protective Methods: When vapor concentrations exceed allowable standards, full facemasks with organic vapor canisters or air-supplied respirators are furnished. Impervious protective clothing and gloves are worn to cover exposed portions of the body of employees exposed to liquid xylene. Change xylene-wet clothing quickly. Personal hygiene, as well as appropriate changes of work clothes, is necessary. Goggles or safety glasses in areas of spill or splash, or in areas where vapor concentrate, are advised. Barrier creams may be useful.

PHENOLS AND PHENOLIC COMPOUNDS

These materials generally enter the body by inhalation and skin absorption. Some are highly irritating to the skin, mucous membranes of the upper respiratory tract and eyes. Some are corrosive for all tissue; cresote, a complex mixture of phenolic and aromatic com-

pounds, may cause skin cancer. Systemic effects usually involve the central nervous or cardio-vascular systems or both; this may be accompanied by kidney and liver damage.

Appropriate engineering controls and personal protective devices should be used to prevent absorption by either the respirator or skin route and eye protection should be utilized where necessary.

Cresol

Description: Cresol is a colorless, yellowish, brown-yellow or pinkish liquid with a phenolic odor. Cresol may be combustible.

Synonyms: Cresylic acid, cresylol, hydroxytoluene, methyl phenol, oxytoluene, tricresol.

Potential Occupational Exposures: Cresol is used as a disinfectant, solvent and stabilizer in paints.

A partial list of occupations in which exposure may occur includes: Paint Makers, Paint Remover Workers, Painters and Stain Workers.

Permissible Exposure Limits: The Federal standard is 5 ppm (22 mg/m^3).

Routes of Entry: Inhalation or skin absorption of liquid or vapor.

Harmful Effects

Local—Cresol is very corrosive to all tissues. It may cause burns if it is not removed promptly and completely and in case of extensive exposure, if it is not removed completely from contaminated areas of the body very quickly, death may result. When it contacts the skin, it may not produce any sensation immediately. After a few moments, pricking and intense burning occur. This is followed by loss of feeling. The affected skin shows wrinkling, white discoloration and softening. Later gangrene may occur. If the chemical contacts the eyes, it may cause extensive damage and blindness. A skin rash may result from repeated or prolonged exposure of the skin to low concentrations of cresol. Discoloration of the skin may also occur from this type of exposure.

Systemic—When cresol is absorbed into the body either through the lungs, skin or mucous membranes, or by swallowing, it may cause systemic poisoning. The signs and symptoms of systemic poisoning may develop in 20 or 30 minutes. These toxic effects include: weakness of the muscles, headache, dizziness, mental disturbances and skin rash. Death may result if there has been severe damage to the liver and kidneys.

Medical Surveillance: Check the skin, eyes, respiratory system and liver and kidney function.

Special Tests: Cresol can be determined in urine, but because large amounts are normally present, a urine test is of little value as a procedure for evaluating exposure.

Personal Protective Methods: Protective goggles and clothing are worn to prevent direct contact with cresol. Respirators with organic vapor canisters are advisable in areas of vapor concentration.

Phenol

Description: Phenol is a white crystalline substance with a distinct aromatic, acrid odor.

Synonyms: Carbolic acid, phenic acid, phenylic acid, phenyl hydrate, hydroxybenzene, monohydroxybenzene.

Potential Occupational Exposures: Phenol is used in the production or manufacture of paints, paint removers, wood preservatives and synthetic resins as a stabilizer and solvent.

A partial list of occupations in which exposure may occur includes: Paint and Paint Remover Workers.

Permissible Exposure Limits: The Federal standard is 5 ppm (19 mg/m^3).

Routes of Entry: Inhalation of mist or vapor; skin absorption of mist, vapor or liquid.

Harmful Effects

Local—Phenol has a marked corrosive effect on any tissue. When it comes in contact with the eyes, it may cause severe damage and blindness. On contact with the skin, it does not cause pain but causes a whitening of the exposed area. If the chemical is not removed promptly, it may cause a severe burn or systemic poisoning.

Systemic—Systemic effects may occur from any route of exposure. These include paleness, weakness, sweating, headache, ringing of the ears, shock, skin discoloration, excitement, frothing of the nose and mouth, dark colored urine and death. If death does not occur, kidney damage may appear.

Repeated or prolonged exposure to phenol may cause chronic phenol poisoning. This condition is very rarely reported. The symptoms of chronic poisoning include vomiting, difficulty in swallowing, diarrhea, lack of appetite, headache, fainting, dizziness, dark urine, mental disturbances and possibly, skin rash. Liver and kidney damage and discoloration of the skin may occur.

Medical Surveillance: Check the skin, eyes, liver and kidney function.

Special Tests: Phenol can be determined in blood or urine.

Personal Protective Methods: In areas where there is likelihood of a liquid spill or splash, impervious protective clothing and goggles are worn. In areas of vapor concentration, full facemask respirators with forced air supply is used, as well as protective clothing, gloves, rubber boots and apron.

AROMATIC HALOGENATED HYDROCARBONS

Aromatic halogenated compounds are used in the manufacture of resins. The vapor and liquid of some

of these compounds are highly irritating to all mucous membranes and skin.

The chlorinated naphthalenes and diphenyls produce a severe and disfiguring acne on skin contact. Skin absorption and inhalation of vapor may lead to severe liver damage in certain instances.

With exception of the chlorinated benzenes, the more highly chlorinated the compound, the greater the toxicity.

Chlorodiphenyls and Derivatives

Description: Chlorodiphenyls are light, straw-colored liquids with typical chlorinated aromatic odors.

Synonyms: Chlorobiphenyls, polychlorinated diphenyl, PCB.

Potential Occupational Exposures: Chlorinated diphenyls are used alone and in combination with chlorinated naphthalenes. They are used as solvents in wax finishes or resin paints.

A partial list of occupations in which exposure may occur includes: Lacquer Makers, Paint Makers and Painters.

Permissible Exposure Limits: The Federal standards for dichlorophenyl (42%) and dichlorodiphenyl (54%) are 1 mg/m^3 and 0.5 mg/m^3 respectively.

Routes of Entry: Inhalation of fume or vapor and skin absorption of liquid.

Harmful Effects

Local—Prolonged skin contact with its fumes or cold wax may cause black heads, oily cysts, and pustules, known as chloracne. Irritation to eyes, nose and throat may also occur. The above standards are considered low enough to prevent systematic effects, but it is not known whether or not these levels will prevent local effects.

Systemic—Acute and chronic exposure can cause liver damage. Signs and symptoms include edema, jaundice, vomiting, loss of appetite, nausea, abdominal pain and fatigue.

Studies of accidental oral intake indicate that chlorinated diphenyls cause stillbirth, a characteristic grey-brown skin and increased eye discharge in infants born to women exposed during pregnancy.

Medical Surveillance: Check the skin, lung and liver function. Possible effects on the fetus should be considered.

Special Tests: None in common use.

Personal Protective Methods: Protection of exposed skin is encouraged, since the above standards may not be low enough to prevent chloracne. Barrier creams, protective clothing and personal hygiene are good protective measures. Respirators are used in areas of vapor concentration.

Chlorinated Benzenes

Description: Chlorinated benzenes are colorless liquids at room temperature and have an aromatic odor. The more highly substituted compounds are crystals (typically monoclinic).

Synonyms

Chlorobenzene: Phenyl chloride, monochlorobenzene, chlorobenzol.

o-dichlorobenzene: 1,2-dichlorobenzene.
m-dichlorobenzene: 1,3-dichlorobenzene.
0-dichlorobenzene: 1,4-dichlorobenzene.
1,2,3-trichlorobenzene: None.
1,2,4-trichlorobenzene: None.
1,3,5-trichlorobenzene: None.
1,2,4,5-tetrachlorobenzene: None.

Potential Occupational Exposures: Chlorobenzene is used as a solvent. o-Dichlorobenzene is used as a solvent, fumigant and insecticide. p-Dichlorobenzene finds use as an insecticide. Other chlorinated benzenes are not as widely used in industry but find use as chemical intermediates and to a lesser extent as insecticides and solvents.

A partial list of occupations in which exposure may occur includes: Lacquer Workers and Paint Workers.

Permissible Exposure Limits: The Federal standards are: chlorobenzene, 75 ppm, (350 mg/m^3); o-dichlorobenzene, 50 ppm, (300 mg/m^3); and p-dichlorobenzene, 75 ppm, (450 mg/m^3).

Threshold limit values for the other compounds have not as yet been established.

Routes of Entry: Inhalation of vapor, skin absorption of the liquid.

Harmful Effects

Local—Chlorinated benzenes are irritating to the skin, eyes and mucous membranes of the upper respiratory tract. Prolonged or repeated contact with liquid chlorinated benzenes may cause skin burns.

Systemic—Acute exposure to these compounds may cause drowsiness, loss of coordination and unconsciousness. Animal exposures have produced liver damage.

Chronic exposure may result in liver, kidney and lung damage, as indicated by animal experiments.

Medical Surveillance: Check the skin, liver, lung and kidney.

Special Tests: None commonly used. Urinary excretion of 2,5-dichlorophenol may be useful as an index of exposure.

Personal Protective Methods: Barrier creams, protective clothing and good personal hygiene are good preventive measures. Respirators in areas of vapor concentrations are advised.

AROMATIC AMINES

Most of the aromatic amines are readily absorbed through the skin in addition to the respiratory route. The amino salts have a lower amount of skin absorption. The

two major toxic effects of these compounds are methemoglobinemia and cancer of the urinary tract. Other effects may be blood in the urine, inflammation of the bladder, anemia and skin sensitization.

Several of the aromatic amines have been shown to be carcinogenic in humans or animals or both. Occupational tumors of the bladder were recognized in the dyestuff industry as early as 1895. The most common site of cancer is the bladder, but cancer of the pelvis, ureter, kidney and urethra do occur.

The minimum exposure which produces cancer is not known. There are documented cases of tumors with exposure of less than one year; however, the latent period from first exposure to the development of tumors is usually long and ranges from four to over 40 years, with a mean of about 20 years. Bladder tumors are also relatively common in unexposed populations, and the incidence is considerably increased in heavy smokers. They are more common in older age males. It is unknown whether smoking plus exposure to a bladder carcinogen would be synergistic, but this seems possible; e.g., asbestos and smoking.

Because there may be significant skin absorption of the aromatic amines, protective clothing and polyvinyl chloride or rubber gloves should be worn and adequate wash and change facilities provided. Workers exposed to carcinogens must have a complete change of work clothes in addition to protective clothing. The recommended means of control of carcinogenic compounds is by engineering methods aimed at some exposure levels and a program of periodic medical surveillance.

Aniline

Description: Aniline is a clear, colorless, oily liquid with a characteristic odor.

Synonyms: Aminobenzene, phenylamine, aniline oil, aminophen, arylamine.

Potential Occupational Exposures: Aniline is used in the manufacture of resins and varnishes.

A partial list of occupations in which exposure may occur includes: Varnish Workers.

Permissible Exposure Limits: The Federal standard is 5 ppm (19 mg/m^3).

Routes of Entry: Inhalation of vapors; skin absorption of liquid and vapor.

Harmful Effects

Local—Liquid aniline is mildly irritating to the eyes and may cause corneal damage.

Systemic—Absorption of aniline causes oxygen deficiency. Moderate exposure may cause only skin discoloration. As oxygen deficiency increases, the skin discoloration may be associated with headache, weakness, irritability, drowsiness, loss of breath and unconsciousness. If treatment is not given promptly, death can occur.

Medical Surveillance: Physical examinations should be performed on all employees working in aniline exposure areas. These should include (1) a work history to discover information on all past exposures to aniline, other aromatic amines and nitro compounds known to cause chemical skin discoloration; (2) a clinical history of any occurrence of chemical skin discoloration; (3) a personal history to elicit alcohol drinking habits, and (4) a general physical examination with particular reference to the cardiovascular system. Persons with impaired cardiovascular status may be at greater risk. A preplacement complete blood count and methemoglobin estimation should be performed as baseline levels, also follow-up studies including periodic blood tests.

Special Tests: Methemoglobin levels and other abnormal hemoglobins and/or urine para-aminophenols and other aniline metabolites have been used for biologic monitoring for occupational aniline exposure.

Personal Protective Methods: In areas of vapor concentration, the use of respirators alone is not sufficient. Skin protection by protective clothing is provided even though there is no skin contact with liquid aniline. Butyl rubber protective clothing is reportedly superior to other materials. In severe exposure situations, use complete body protection consisting of air-conditioned suit with air supplied helmet and cape. Personal hygiene practices include prompt removal of clothing which has absorbed aniline, thorough showering after work and before changing to street clothes and wearing clean work clothes daily.

Nitrobenzene

Description: Nitrobenzene is a pale yellow liquid whose odor resembles bitter almonds.

Synonyms: Nitrobenzol, oil of mirbane, oil of bitter almonds.

Potential Occupational Exposures: Nitrobenzene is used as a solvent. It is also used in floor polishes and paint solvents.

A partial list of occupations in which exposure may occur includes: Paint Makers and Painters.

Permissible Exposure Limits: The Federal standard is 1 ppm (5 mg/m^3).

Routes of Entry: Inhalation and skin absorption of liquid.

Harmful Effects

Local—Nitrobenzene may cause irritation of the eyes.

Systemic—There is a latent period of one to four hours before signs and symptoms appear. Nitrobenzene affects the central nervous system producing fatigue, headache, false sense of movement, vomiting, general weakness and in some cases severe depression, unconsciousness and coma. Chronic exposure may lead to spleen and liver damage, jaundice and liver impairments. Alcohol ingestion may increase the toxic effects.

Medical Surveillance: Check the history of disease, reactions to medications, alcohol intake, eye disease, skin and cardiovascular status. Liver and kidney func-

tions should be evaluated periodically, as well as blood and general health.

Special Tests: Follow methemoglobin levels until normal in all cases of suspected skin discoloration. The metabolites in urine, p-nitro and p-amino phenol, can be used as an evidence of exposure.

Personal Protective Methods: Impervious protective clothing is worn in areas where risk of splash or spill exists. When splashed or spilled on ordinary work clothes, remove clothes at once and wash the skin area thoroughly. In areas of vapor concentration, full facemasks with organic vapor canisters or air-supplied respirators are used. Supply clean work clothing daily and shower after each shift before changing to street clothes.

Nitroparaffins

Description: Nitroparaffins are colorless liquids.

Synonyms: None.

Potential Occupational Exposures: Nitroparaffins are used as solvents for cellulose esters, vinyl copolymer and other resins. They are also used in various coating materials such as shellac, synthetic and processed rubber, paint and varnish removers, alkyl resins and other high polymer coatings.

A partial list of occupations in which exposure may occur includes: Stainers and Paint Workers.

Permissible Exposure Limits: The Federal standards for these substances are: nitromethane 100 ppm (250 mg/m^3), nitroethane 100 ppm (310 mg/m^3), 1-nitropropane 25 ppm (90 mg/m^3), and 2-nitropropane 25 ppm (90 mg/m^3).

Route of Entry: Inhalation of vapor.

Harmful Effects

Local—The nitroparaffins are irritants to the eyes, upper respiratory tract and skin.

Systemic—Only one report of occupational illness from nitroparaffins has been made. The workers were exposed to 20-45 ppm of 2-nitropropane and complained of loss of appetite, nausea, vomiting, diarrhea and headache. Animal experiments indicate that high concentrations of nitroparaffins may produce light narcosis and central nervous system irritation. The lethal dose is generally lower than that producing significant narcosis. Liver and kidney damage have been observed in animals at lethal concentrations.

Medical Surveillance: Check the respiratory and central nervous system and liver and kidney function.

Special Tests: None commonly used. In the case of 2-nitropropane, Heins bodies and methemoglobin levels would be of interest.

Personal Protective Methods: Barrier creams or gloves to protect exposed skin and, where vapor concentrations are excessive, full facemasks with organic vapor canister or air supplied respirators are advised.

MISCELLANEOUS ORGANIC NITROGEN COMPOUNDS

This group of organic nitrogen compounds includes examples of heterocyclic compounds, hydrazines, substituted amides, an imine and a nitrosoamine.

Pyridine

Description: Pyridine is a colorless liquid with an unpleasant odor. It is both flammable and explosive when exposed to a flame and decomposes on heating to release cyanide fumes. The odor can be detected well below 1 ppm.

Synonyms: Azine.

Potential Occupational Exposures: Pyridine is used in the manufacture of paints.

A partial list of occupations in which exposure may occur includes: Paint Makers.

Permissible Exposure Limits: The Federal standard is 5 ppm (15 mg/m^3).

Routes of Entry: Inhalation of vapor and skin absorption of liquids.

Harmful Effects

Local—Irritation of the eyes, mucous membranes of the upper respiratory tract and skin. It occasionally causes skin sensitization and photosensitization.

Systemic—Very high concentrations may cause narcosis. Repeated, intermittent, or continuous low level exposure may lead to transient effects on the central nervous system and gastrointestinal tract. The symptoms include headache, dizziness, insomnia, nervousness, loss of appetite, nausea, vomiting and diarrhea. Low back pain and urinary frequency with no changes in urine sediment or liver or kidney function have been reported to follow exposures to about 100 ppm. Liver and kidney injury have been reported from its use as an oral medication.

Medical Surveillance: Check the skin, central nervous system and liver and kidney function.

Special Tests: None in common use. Metabolites are known and can be determined in blood and urine.

Personal Protective Methods: Rubber and plastic gloves should not be relied upon to prevent contact with pyridine as its salts penetrate the material. The odor is detectable at less than 1 ppm but cannot be relied upon as a warning measure. In areas of elevated vapor concentration, workers are supplied with full facemask, supplied-air respirators and protective clothing. Clothing contaminated by spills or splashes is immediately changed and discarded and the skin is thoroughly washed. Clean work clothes are supplied daily with the worker showering after a shift before changing to street clothes.

Carbon Disulfide

Description: Carbon disulfide is a highly flammable liquid which in pure form has a sweet odor and in

commercial and reagent grades has a foul smell. It can be detected by odor at about 1 ppm but the sense of smell fatigues rapidly and odor does not serve as a good warning property.

Synonyms: Carbon bisulfide, dithiocarbonic anhydride.

Potential Occupational Exposure: Carbon disulfide is used in the manufacture of paints, enamels, paint removers, varnishes and varnish removers, and as a solvent for waxes, lacquers and resins.

A partial list of occupations in which exposure may occur includes: Lacquer Workers, Paint Workers and Varnish Makers.

Permissible Exposure Limits: The Federal standard is 20 ppm (60 mg/m^3) determined as an eight-hour TWA. The acceptable ceiling concentration is 30 ppm (90 mg/m^3) with a maximum peak above this for an eight-hour workshift of 100 ppm (300 mg/m^3) for a maximum duration of 30 minutes.

Routes of Entry: Inhalation of vapor which may be compounded by skin absorption of liquid or vapor.

Harmful Effects

Local—Carbon disulfide vapor is severely irritating to eyes, skin and mucous membranes. Contact with liquid may cause blistering with second and third degree burns. Skin sensitization may occur. Skin absorption may result in localized degeneration of nerves, most often in the hands. Respiratory irritation may result in bronchitis and emphysema, though these effects may be overshadowed by systemic effects.

Systemic—Intoxication from carbon disulfide can result in psychological, neurological and cardiovascular disorders. Recent evidence indicates that once biochemical alterations are initiated they may remain latent; clinical signs and symptoms then occur following subsequent exposure.

Following repeated exposure, behavioral disorders have been observed. Acute exposure may result in extreme irritability, uncontrollable anger, suicidal tendencies and a toxic manic depressive psychosis. Chronic exposures have resulted in insomnia, nightmares, defective memory and impotency. Less dramatic changes include headache, dizziness and diminished mental and motor ability, with staggering gait and loss of coordination.

Chronic exposure results in eye damage, loss of sense of smell, tremors, tingling sensation, weakness and, most typically, loss of lower extremity reflexes.

Atherosclerosis and coronary heart disease have been linked to exposure to carbon disulfide. Atherosclerosis develops most notably in the blood vessels of the brain, glomeruli and myocardium. Abnormal electroencephalograms and retina hypertension typically occur before kidney involvement is noted. Any of the above three areas may be affected by chronic exposure, but most often only one aspect can be observed. A significant increase in coronary heart disease mortality has been observed in carbon disulfide workers. Studies also reveal higher frequency of pain around the heart and hypertension. Abnormal electrocardiograms may also occur and are also suggestive of carbon disulfide's role in coronary disease.

Other specific effects include chronic gastritis with the possible development of ulcers; impairment of endocrine activity, specifically adrenal and testicular; abnormal erythrocytic development with hypochromic anemia; and possible liver dysfunction with abnormal serum cholesterol. Also in women, chronic menstrual disorders may occur. These effects usually occur following chronic exposure are subordinate to the other symptoms.

Medical Surveillance: Check the skin, eyes, central and peripheral nervous system, cardiovascular system and liver and kidney function. Electrocardiograms should be taken.

Special Tests: Carbon disulfide can be determined in expired air, blood and urine. The iodineazide test is most useful although non-specific, and it may indicate other sulfur compounds.

Personal Protective Methods: Local exhaust, general ventilation and personal protective equipment are all utilized. In modern manufacture, carbon disulfide fumes are generally controlled by closed operations. Where fumes are present in unacceptable concentrations, gas mask respirator with full face or airline respirators are used. In all areas where there is likelihood of spill or splash on any skin area wear protective clothing, goggles, face shields, aprons and coats.

METALS

Arsenic

Description: Arsenic occurs to a limited extent in nature as a steel gray metal. Arsenic includes the element and any of its inorganic compounds excluding arsine.

Synonyms: None.

Potential Occupational Exposures: Arsenic compounds are used in pigment production.

A partial list of occupations in which exposure may occur includes: Painters and Paint Makers.

Permissible Exposure Limits: The Federal standard for arsenic and its compounds is 0.5 mg/m^3 of air. NIOSH has recommended 0.002 mg/m^3 of air as based on its carcinogenic effects.

Routes of Entry: Inhalation and ingestion of dust and fumes.

Harmful Effects

Local—Arsenic compounds are corrosive to the skin. Brief contact has no effect, but prolonged contact results in a local skin eruption. The moist mucous membranes are most sensitive to irritant action. Eyes, skin, eyelids, ears, nose, mouth and respiratory mucous are also vulnerable to irritant effects. The wrists are common

18

sites of dermatitis, as are the genitalia if personal hygiene is poor. Perforations of the nasal septum may occur. Arsenic trioxide and pentoxide are capable of producing skin sensitization and contact dermatitis. Arsenic is also capable of producing growths, especially of the palms and soles. Arsenic has been cited as a cause of skin cancer, but the incidence is low.

Systemic—The acute toxic effects of arsenic are generally seen following ingestion of inorganic arsenical compounds. This rarely occurs in an industrial setting. Symptoms develop within one-half to four hours following ingestion and are usually characterized by constriction of the throat followed by inability to swallow, epigastric pain, vomiting and watery diarrhea. Blood may appear in vomit and stools. If the amount ingested is sufficiently high, shock may develop due to severe fluid loss and death may follow in 24 hours. If the acute effects are survived, dermatitis and inflammation of the peripheral nerves may develop.

Chronic arsenical poisoning due to ingestion is also rare and generally confined to patients taking prescribed medications. Symptoms are weight loss, nausea and diarrhea alternating with constipation, pigmentation and eruption of the skin, loss of hair and inflammation of the peripheral nerves. Chronic hepatitis and cirrhosis have been reported.

Inhalation of organic arsenic compounds is the most common cause of chronic poisoning in the industrial situation. This condition is divided into three phases based on signs and symptoms.

First Phase: Weakness, loss of appetite, some nausea, occasional vomiting, a sense of heaviness in the stomach and some diarrhea.

Second Phase: Eye irritation and inflammation of the mucous membranes of the nose, larynx and respiratory passage. Inflammation of the nasal mucous membrane, hoarseness and mild tracheobronchitis may occur. Perforation of the nasal septum is common and is probably the most typical lesion of the upper respiratory tract in occupational exposure to arsenical dust. Skin lesions are common.

Third Phase: Inflammation of the peripheral nerves, initially of hands and feet, which is essentially sensory. In more severe cases, motor paralyses occur.

Liver damage from chronic arsenical poisoning is considered possible. Arsenic has a depressant effect upon the bone marrow, with disturbances of both red and white blood cell production. Evidence now shows arsenic compounds to cause lung cancer and skin cancer.

Medical Surveillance: Check allergic and chronic skin lesions, eye disease, psoriasis, chronic eczematous dermatitis, hyperpigmentation of skin, growths and warts, baseline weight, baseline blood and hemoglobin count and baseline urinary arsenic determinations. In annual examinations, the worker's general health, weight and skin condition should be checked. Look for any evidence of excessive exposure or absorption of arsenic.

Special Tests: Chest x-rays and lung function should be evaluated; analysis of urine, hair or nails for arsenic should be made every 60 days as long as exposure continues.

Personal Protective Methods: Workers are trained in personal hygiene and sanitation, the use of personal protective equipment and early recognition of symptoms of absorption, skin contact irritation and sensitivity. With the exception of arsine and arsenic trichloride, the compounds of arsenic do not have odor or warning qualities. In case of emergency or areas of high dust or spray mist, workers wear respirators that are supplied-air or self-contained positive-pressure type with full facemask. Where concentrations are less than 100 × standard, workers may be able to use halfmask respirators with replaceable dust or fume filters. Protective clothing, gloves and goggles, a hood for head and neck are provided. When liquids are processed, impervious clothing is supplied. Clean work clothes are supplied daily, and workers shower prior to changing to street clothes.

Antimony and Compounds

Description: Antimony is a silvery-white, soft metal. The ores most often found are stibnite, valentinite, kermesite and senarmontite.

Synonyms: None.

Potential Occupational Exposures: Pure antimony compounds are used as pigments. They are also used in the manufacture of paints, lacquers and glazes. A highly toxic gas, stibine, may be released from the metal under certain conditions.

A partial list of occupations in which exposure may occur includes: Paint Workers.

Permissible Exposure Limits: The Federal standard for antimony and its compounds is 0.5 mg/m^3, expressed as Sb (*See also:* Stibine).

Route of Entry: Ingestion or inhalation of dust or fume; skin absorption.

Harmful Effects

Local—Antimony and its compounds are generally regarded as primary skin irritants. Lesions generally appear on exposed, moist areas of the body, but rarely on the face. The dust and fumes are also irritants to the eyes, nose and throat and may be associated with inflammation of the gums, anemia and ulceration of the nasal septum and larynx. Antimony trioxide causes a dermatitis known as "antimony spots," which results in intense itching followed by skin eruptions. Lesions occur in hot weather and are due to dust accumulating on exposed areas that are moist due to sweating.

Systemic—Systemic intoxication is uncommon from occupational exposure.

Antimony metal dust and fumes are absorbed from the lungs into the bloodstream. Principal organs attacked include certain enzyme systems, heart, lungs and the mucous membrane of the respiratory tract. Symptoms of acute oral poisoning include violent irritation

of the nose, mouth, stomach and intestines, vomiting, bloody stools, slow shallow respiration, pulmonary congestion, coma and sometimes death due to circulatory or respiratory failure. Chronic oral poisoning presents symptoms of dry throat, nausea, headache, sleeplessness, loss of appetite and dizziness. Liver and kidney damage are late manifestations.

Antimony compounds are generally less toxic than antimony. Antimony trisulfide, however, has been reported to cause heart beat changes in humans and experimental animals. Antimony trichloride and pentachloride are highly toxic and can irritate and corrode the skin. Antimony fluoride is extremely toxic, particularly to pulmonary tissue and skin.

Medical Surveillance: Check lung disease, skin disease, disease of the nervous system, heart and gastrointestinal tract. Lung function, EKG's, blood and urine should be evaluated periodically.

Special Tests: Blood and urine antimony levels have been suggested, but are not in common use.

Personal Protective Methods: A combination of protective clothing, barrier creams, gloves and personal hygiene protect the skin. Washing and showering facilities should be available and eating is not permitted in exposed areas. Dust masks and supplied air respirators should be available in all areas where the Federal standard is exceeded.

Barium and Compounds

Description: Barium is a silver white metal. Barium may ignite spontaneously in air in the presence of moisture.

Synonyms: None.

Potential Occupational Exposures: Barium compounds are used as extenders in paints and as pigments.

A partial list of occupations in which exposure may occur includes: Paint Workers.

Permissible Exposure Limits: Federal standard for soluble barium compound is 0.5 mg/m^3.

Routes of Entry: Ingestion or inhalation of dust or fume.

Harmful Effects

Local—Alkaline barium compounds may cause local irritation to the eyes, nose, throat and skin.

Systemic—Barium poisoning is virtually unknown in industry, although the potential exists. When ingested barium compounds affect all muscles. The heart rate is slowed and may stop. Other effects are increased intestinal peristalsis, vascular constriction, bladder contraction and increased voluntary muscle tension.

The inhalation of the dust of barium sulfate may lead to deposition in the lungs in sufficient quantities to produce "baritosis"—a benign pneumoconiosis.

Medical Surveillance: Check the skin, eyes, heart and lungs.

Special Tests: None have been used.

Personal Protective Methods: Employees receive instruction in personal hygiene and the importance of not eating in work areas. Good housekeeping and adequate ventilation are essential. Dust masks respirators or goggles may be needed where amounts of significant soluble or alkaline forms are encountered, as well as protective clothing.

Cadmium and Compounds

Description: Cadmium is a bluish-white metal. Small amounts of cadmium are found in zinc, copper and lead ores.

Synonyms: None.

Potential Occupational Exposures: Various cadmium compounds are used as pigments in paints.

A partial list of occupations in which exposure may occur includes: Paint Workers.

Permissible Exposure Limits: The Federal standard for cadmium fume is 0.1 mg/m^3 (as Cd) as an eight-hour TWA with an acceptable ceiling of 3 mg/m^3. For cadmium dust, the standard is 0.2 mg/m^3 (Cd) as an eight-hour TWA with an acceptable maximum ceiling of 0.6 mg/m^3. NIOSH has recommended a TWA limit of 40 micrograms/m^3 with a ceiling limit of 200 micrograms in a five-minute sampling period.

Routes of Entry: Inhalation or ingestion of fumes or dust.

Harmful Effects

Local—Cadmium is an irritant to the respiratory tract. Prolonged exposure can cause loss of the sense of smell and a yellow stain or ring that gradually appears on the teeth. Cadmium compounds are poorly absorbed from the intestinal tract, but relatively well absorbed by inhalation. Skin absorption appears negligible. Once absorbed, cadmium has a very long half-life and is retained in the kidney and liver.

Systemic—Acute toxicity is almost always caused by inhalation of cadmium fumes or dust produced when cadmium is heated. There is generally a latent period of a few hours after exposure before symptoms develop. During the ensuing period, symptoms may appear progressively. The earliest symptom is slight irritation of the upper respiratory tract. This may be followed over the next few hours by cough, pain in the chest, sweating and chills which resemble the symptoms of nonspecific upper respiratory infection. Eight to 24 hours following acute exposure, severe pulmonary irritation may develop, with pain in the chest, loss of breath, cough and general weakness. Loss of breath may become more pronounced as pulmonary edema develops. The death rate in acute cases is about 15 percent. Patients who survive may develop emphysema and heart disease; recovery can be prolonged.

Chronic cadmium poisoning has been reported after prolonged exposure to cadmium oxide fumes, cadmium oxide dust, cadmium sulfides and cadmium stearates.

Heavy smoking has been reported to increase tissue cadmium levels. In some cases, only the respiratory tract is affected. In others, the effects may be systemic due to absorption of the cadmium. Lung damage often results in emphysema which in some instances is not preceded by a history of chronic bronchitis or coughing. This type of emphysema can be extremely disabling. Some studies have not shown these effects.

Systemic changes due to cadmium absorption include damage to the kidneys with protein in the urine, anemia and elevated sedimentation rate. Of these, protein in the urine is the most typical. In advanced stages of the disease, there may be increased urinary excretion of amino acids, glucose, calcium and phosphates. These changes may lead to the formation of kidney stones. If the exposure is discontinued, there is usually no progression of the kidney damage. Mild anemia is another systemic condition sometimes found in chronic exposure to cadmium.

In studies with experimental animals, cadmium has produced damage to the liver and central nervous system, testicular atrophy, birth defects, decrease in total red cells, cancer and irregular growth in the testes. Hypertensive effects have also been produced. None of these conditions, however, has been found to result from occupational exposure to cadmium. Heavy smoking appears to increase the risk of cumulative toxic effects.

Medical Surveillance: Check the history of kidney disease, smoking and respiratory disease. A chest X-ray and baseline pulmonary function study is recommended. Periodic examinations should emphasize the respiratory system, including pulmonary function tests, kidneys and blood.

Special Tests: A low molecular weight protein in the urine may be the earliest indication of kidney toxicity. The trichloroacetic acid test may pick this up, but more specific quantitative studies would be preferable. If kidney disease due to cadmium is present, there may also be increased excretion of calcium, amino acids, glucose and phosphates.

Personal Protective Methods: Most important is the requirement that each worker is adequately safeguarded by effective respiratory protection: dust masks, vapor canister respirators or supplied-air respirators. Clothing is changed after each shift and clean work clothing issued each day. Food is not to be eaten in contaminated work areas. Workers should shower after each shift before changing to street clothes.

Chromium and Its Compounds

Description: This group includes chromium trioxide, chromium oxide, chromic acid anhydride and its aqueous solutions.

Synonyms: None.

Potential Occupational Exposures: Chromates are used as pigments in yellow, orange and green paints.

A partial list of occupations in which exposure may occur includes: Paint Makers, Painters and Abrasive Blasters.

Permissible Exposure Limits: The Federal standard for chromic acid and chromates is 0.1 mg/m^3 as a ceiling concentration. The NIOSH Criteria for a Recommended Standard would set work place limits for chromic acid of 0.05 mg/m^3 as chromium trioxide as a TWA with a ceiling concentration of 0.1 mg/m^3 as chromium trioxide determined by a sampling time of 15 minutes.

Routes of Entry: Skin absorption, inhalation and ingestion.

Harmful Effects

Local—In some workers, chromium compounds are allergens which cause dermatitis. They may also produce pulmonary sensitization. Chromic acid has a direct corrosive effect on the skin and the mucous membranes of the upper respiratory tract; and although rare, the possibility of skin and pulmonary sensitization should be considered.

Systemic—Acute exposures to dust or mist may cause coughing, wheezing, headache, loss of breath, pain on deep breathing, fever and loss of weight. Tracheobronchial irritation and edema persist after other symptoms subside.

Working in the chromate-producing industry increases the risk of lung cancer.

Medical Surveillance: Check the work history to determine past exposure to chromic acid and hexavalent chromium compounds, exposure to other carcinogens, smoking history, history of skin or pulmonary sensitization to chromium, history or presence of dermatitis, skin ulcers, or lesions of the nasal mucous and/or perforation of the septum and a chest X-ray. On periodic examinations, an evaluation should be made of skin and respiratory complaints, especially in workers who demonstrate allergic reactions. Chest X-rays should be taken yearly for workers over age 40, and every five years for younger workers. Blood, liver and kidney function should be evaluated periodically.

Special Tests: Urinary chromate values have been studied in relation to exposure, but their value is questionable.

Personal Protective Methods: Full body protective clothing is worn in areas of chromic acid exposure and impervious gloves, aprons and footwear in areas where spills or splashes may contact the skin. Where chromic acid may contact the eyes by spills or splashes, impervious protective goggles or face shield are needed. All clothing should be changed at the end of the shift and showering encouraged prior to change to street clothes. Clean clothes are needed at the start of the shift. Respirators are used in areas where dust, fumes or mist exposure exceeds Federal standards or where brief concentrations exceed the TWA and for emergencies. Dust, fume and mist filter type respirators or supplied-air respirators should be used by all workers exposed, depending on concentration of exposure.

Cobalt and Compounds

Description: Cobalt is a silver-grey, hard, brittle, magnetic metal.

Synonyms: None.

Potential Occupational Exposures: Various cobalt compounds are used as pigments in enamels, glazes and paints.

A partial list of occupations in which exposure may occur includes: Paint Workers.

Permissible Exposure Limits: The Federal standard for cobalt, metal fume and dust is 0.1 mg/m^3.

Routes of Entry: Inhalation of dust or fume.

Harmful Effects

Local—Cobalt dust is mildly irritating to the eyes and, to a lesser extent, the skin. It has caused allergic sensitivity type dermatitis among workers in some industries where only minute quantities of cobalt are used. The eruptions appear in the creases of the elbow, knee, ankles and neck. Cross sensitization occurs between cobalt and nickel, and to chromium when cobalt and chromium are combined.

Systemic—Inhalation of cobalt dust may cause an asthma-like disease with cough and loss of breath. This situation may progress to pneumonia with marked fibrosis. Pneumoconiosis may develop which is believed to be reversible. Since cobalt dust is usually combined with other dusts, the role cobalt plays in causing the pneumoconiosis is not entirely clear.

Ingestion of cobalt or cobalt compounds is rare in industry. Vomiting, diarrhea and a sensation of hotness may occur after ingestion or after the inhalation of excessive amounts of cobalt dust. Heart disease has also been reported, but the role of cobalt remains unclear in this siutation.

Medical Surveillance: Check the history of skin disease, allergic dermatitis, baseline allergic respiratory disease and smoking history. A baseline chest X-ray should be taken. Periodic examinations should be directed toward skin respiratory system and lung function.

Special Tests: None are in common use.

Personal Protective Methods: Where dust levels are excessive, dust respirators are used by all workers. Protective clothing should be issued to all workers and changed on a daily basis. Showering after each shift is encouraged prior to change to street clothes. Gloves and barrier creams may be helpful in preventing dermatitis.

Copper and Compounds

Description: Copper is a reddish-brown metal.

Potential Occupational Exposures: Copper compounds are used as pigments and in the manufacture of powdered bronze paint.

A partial list of occupations in which exposure may occur includes: Pigment Makers, Wallpaper Makers and Paint Workers.

Permissible Exposure Limits: The Federal standard for copper fume is 0.1 mg/m^3, and for copper dusts and mists ,1 mg/m^3.

Route of Entry: Inhalation of dust or fume.

Harmful Effects

Local—Copper salts act as irritants to the skin, causing itching, redness and dermatitis. In the eyes, copper salts may cause eye irritation and ulceration of the cornea. Metallic copper may cause keratinization of the hands and soles of the feet, but it is not commonly associated with industrial dermatitis.

Systemic—Industrial exposure to copper occurs chiefly from fumes generated in welding copper-containing metals. The fumes and dust cause irritation of the upper respiratory tract, metallic taste in the mouth, nausea, metal fume fever and in some instances discoloration of the skin and hair. Inhalation of dusts, fumes and mists of copper salts may cause congestion of the nasal mucous membrances, sometimes of the pharynx, and on occasions, ulceration with perforation of the nasal septum. If the salts reach the gastrointestinal tract, they act as irritants, producing salivation, nausea, vomiting, gastric pain, hemorrhagic gastritis and diarrhea. It is unlikely that poisoning by ingestion in industry would progress to a serious point as small amounts induce vomiting and empty the stomach of copper salts.

Chronic human intoxication occurs rarely.

Medical Surveillance: Check the skin, eyes and respiratory system.

Personal Protective Methods: In areas where copper dust or fume is excessive, workers are provided with proper dust or fume respirators or supplied-air respirator with full facepiece.

Iron Compounds

Description: Iron is a malleable, silver-grey metal.

Synonyms: None.

Potential Occupational Exposures: Iron compounds are used as pigments in paints.

A partial list of occupations in which exposure may occur includes: Paint Workers.

Permissible Exposure Limits: The Federal standard for iron oxide fume is 10 mg/m^3. There are no standards for other iron compounds.

Route of Entry: Inhalation of dust.

Harmful Effects

Local—Soluble iron salts are irritants and their aerosols are irritating to the respiratory tract. Iron compounds as a class are not associated with any particular industrial risk.

Systemic—The inhalation of iron oxide fumes or dust may cause a benign pneumoconiosis (siderosis). It is probable that the inhalation of pure iron oxide does

not cause lung fibrosis, whereas the inhalation of iron oxide plus certain other substances may cause injury.

Iron pentacarbonyl is one of the more dangerous metal carbonyls. It is highly flammable and toxic. Symptoms of overexposure closely resemble those caused by $Ni(CO)_4$ and consist of giddiness and headache, occasionally accompanied by fever, skin discoloration and cough due to pulmonary edema. Death may occur within four to eleven days due to pneumonia, liver damage, vascular injury and central system degeneration.

Medical Surveillance: Check for respiratory disease and lung function. Smoking history should be known. Chest X-rays and pulmonary function should be evaluated periodically especially if symptoms are present.

Personal Protective Methods: Dust mask respirators are recommended for all workers exposed to areas of elevated dust concentrations. In areas where iron oxide fumes are excessive, vapor canister respirators or supplied air respirators are recommended. Generally speaking, protective clothing is not necessary, but attention to personal hygiene, showering and clothes changing should be encouraged.

Lead-Inorganic

Description: Lead is a blue-gray metal which is very soft and malleable.

Synonyms: None.

Potential Occupational Exposures: Lead is used as pigment for paints and varnishes.

A partial list of occupations in which exposure may occur includes: Paint Workers.

Permissible Exposure Limits: The Federal standard for lead and its inorganic compounds is 0.2 mg/m^3 as a time-weighted average. The NIOSH Criteria Document recommends a time-weighted average value of 0.15 mg Pb/m^3.

Routes of Entry: Ingestion of dust; inhalation of dust or fume.

Harmful Effects

Local—None.

Systemic—The early effects of lead poisoning are nonspecific and, except by laboratory testing, are difficult to distinguish from the symptoms of minor seasonal illnesses. The symptoms are decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, digestive symptoms (particularly constipation), abdominal pains and decreased appetite. These symptoms are reversible and complete recovery is possible.

Later findings include anemia, paleness, a "lead line" on the gums and decreased hand-grip strength. Lead colic produces an intense periodic abdominal cramping associated with severe constipation and, occasionally, nausea and vomiting. Alcohol ingestion and physical exertion may precipitate these symptoms. The peripheral nerve affected most frequently is the radial nerve. This will occur only with exposure over an extended period of time and cause "wrist drop." Recovery is slow and not always complete. When the central nervous system is affected, it is usually due to the ingestion or inhalation of large amounts of lead. This results in severe headache, convulsions, coma, delirium and possibly death. The kidneys can also be damaged after long periods of exposure to lead, with the loss of kidney function and progressive increase of nitrogen in the blood.

Medical Surveillance: Check the nervous system, kidney disease and baseline blood lead levels. Periodic physical examinations should include hemoglobin determinations, tests for blood lead levels, evaluation of any gastrointestinal or neurologic systems and kidney function.

Special Tests: Periodic evaluation of blood lead levels are widely used as an indicator of increased or excessive lead absorption. Other indicators are blood and urine coproprophyric III and delta amino low valence acid dehydrase (ALAD). Erythrocytic protoprophyrin determinations may also be helpful.

Personal Protective Methods: Workers are supplied with full body work clothing and cap (hard hats). The dust is removed (vacuumed) before leaving after the shift. Showering after each shift prior to changing to street clothes is encouraged. Dust and fume respirators or supplied-air respirators are supplied to all employees exposed to concentrations above the OSHA standard and in all emergencies. Food is not eaten in contaminated areas.

Manganese and Compounds

Description: Manganese is a reddish-grey or silvery, soft metal.

Synonyms: None.

Potential Occupational Exposures: Manganese and its compounds are utilized in the manufacture of paints and varnishes.

A partial list of occupations in which exposure may occur includes: Paint Workers and Varnish Makers.

Permissible Exposure Limits: Federal standard for manganese is 5 mg/m^3 as a ceiling value.

Routes of Entry: Inhalation of dust or fume; limited skin absorption of liquids.

Harmful Effects

Local—Manganese dust and fumes are minor irritants to the eyes and mucous membranes of the respiratory tract.

Systemic—The dust or fumes enter the respiratory tract and are absorbed into the bloodstream. Manganese is then deposited in major body organs and has a special preference for the liver, spleen and certain nerve cells of the brain and spinal cord. Among workers, there is a very marked variation in individual susceptibility to manganese. Some workers have worked in heavy exposure for a lifetime and have shown no

signs of the disease; others have developed manganese intoxication with as little as 49 days of exposure.

The early phase of chronic manganese poisoning is most difficult to recognize, but it is also most important to recognize since early removal from the exposure may stop the course of the disease. The onset is insidious, with apathy, loss of appetite and loss of strength, headache, hypersomnia, spasms, weakness of the legs, joint pains and irritability. Manganese psychosis follows with certain definitive features: unaccountable laughter, euphoria, impulsive acts, absentmindedness, mental confusion, aggressiveness and hallucinations. These symptoms usually disappear with the onset of true neurological disturbances, or may resolve completely with removal from manganese exposure.

Progression of the disease presents a range of neurological manifestations that can vary widely among individuals affected. Speech disturbances are common: monotonous tone, even complete muteness. The face may take on masklike quality and handwriting may become very small. Disturbances in gait and balance occur and frequently there is a tendency to fall down without movement for protection. Tremors are frequent, particularly of the tongue, arms and legs. These will increase with intentional movements and are more frequent at night. Absolute detachment, broken by sporadic or spasmodic laughter, ensues and there may be excessive salivation and excessive sweating. At this point the disease is indistinguishable from classical Parkinson's disease.

Chronic manganese poisoning is not a fatal disease although it is extremely disabling.

Medical Surveillance: Check general health with special attention to neurologic and personality abnormalities. Periodic physical examinations may be required as often as every two months. Special emphasis should be given to behavioral and neurological changes: speech defects, emotional disturbances, abnormal tension, tremor, equilibrium, difficulty in walking or squatting, inability to make rapid alternating movements and handwriting.

Special Tests: There are no laboratory tests which can be used to diagnose manganese poisoning.

Personal Protective Methods: In areas where the standard is exceeded dust mask respirators or supplied-air respirators are necessary. Education in the use and necessity of these devices is important.

Titanium and Compounds

Description: Titanium is a dark-grey, lustrous metal.

Synonyms: None.

Potential Occupational Exposures: Titanium dioxide is used as a white pigment in the rubber, plastics, paint and varnish industries.

A partial list of occupations in which exposure may occur includes: Paint Workers and Lacquer Makers.

Permissible Exposure Limits: Federal standard for titanium dioxide is 15 mg/m^3. There is no standard for titanium itself or other titanium compounds.

Route of Entry: Inhalation of dust or fume.

Harmful Effects

Local—Titanium and titanium compounds are, for the most part, virtually inert and not highly toxic to humans.

Systemic—During the production of titanium metal, it is possible that the air may be contaminated with chlorine, hydrogen chloride, titanium tetrachloride and similar harmful constituents. Severe lung injury caused by such exposures has been reported; in some cases the condition resembles silicotic lungs.

Medical Surveillance: Check for lung disease, especially if irritant compounds are involved. Chest X-rays should be included in both examinations and pulmonary function evaluated periodically. Smoking history should be taken. Careful attention should be given to the eyes and the skin.

Personal Protective Methods: Employees exposed to titanium tetrachloride wear protective clothing and respirators. In areas of dust or fumes of titanium tetrachloride, all workers should be provided with goggles and dust mask respirators, full-face gas mask respirators or supplied-air respirators. Clothing should be changed daily to avoid dust inhalation from clothing, and employees should be encouraged to shower before changing to street clothes.

Zinc Oxide

Description: Zinc oxide is an amorphous, odorless, white or yellowish-white powder.

Synonyms: Zinc white, flowers of zinc.

Potential Occupational Exposures: Zinc oxide is used in paints, lacquers and varnishes.

A partial list of occupations in which exposure may occur includes: Lacquer Workers, Paint Workers and Varnish Makers.

Permissible Exposure Limits: Federal standard for zinc oxide fume is 5 mg/m^3.

Route of Entry: Inhalation of dust or fumes.

Harmful Effects

Local—When handled under poor hygienic conditions, zinc oxide powder may produce dermatitis. This condition is due primarily to clogging of the oil glands with zinc oxide and produces a red elevated area on the skin with a central plug. The area rapidly becomes inflamed and the central plug develops into a pustule which itches intensely. Lesions occur in areas of the skin that are exposed or subject to heavy perspiration. These usually clear, however, in a week to ten days with good hygiene and proper care of secondary infections.

Systemic—The syndrome of metal fume fever is the only important effect of exposure to freshly formed zinc oxide fumes and zinc oxide dusts of respirable particle size. Typically, the syndrome begins four to

twelve hours after sufficient exposure to freshly formed fumes of zinc oxide. The worker first notices the presence of a sweet or metallic taste in the mouth, accompanied by dryness and irritation of the throat. Cough and shortness of breath may occur, along with general discomfort, a feeling of weakness, fatigue and pains in the muscles and joints. Fever and shaking chills then develop. Fever can range from 102° to 104° F. Profuse sweats develop and the fever subsides. The entire episode runs its course in 24 to 48 hours. During the acute period, there is an elevation of the white blood cell count (rarely above 20,000/ml), and the serum LDH may be elevated. Chest X-rays are not diagnostic.

Metal fume fever produces rapid development of tolerance or short-lived relative immunity. This may be lost, however, over a weekend or holiday, and the worker may again develop the complete syndrome after returning to work if fume levels are sufficiently high.

Other possible systemic effects of zinc oxide are in doubt. Cases of gastrointestinal disturbance have been reported, but most authorities agree there is no evidence of chronic industrial zinc poisoning.

Medical Surveillance: Check the general health of the worker. Examinations are also recommended following episodes of metal fume fever.

Special Tests: Zinc excetion in urine can be used as an index of exposure.

Personal Protective Methods: Employees should receive instruction in personal hygiene and in the causes and effects of metal fume fever. Workers exposed to zinc oxide powder should be supplied daily with clean work clothes and required to shower before changing to street clothes. In cases of accident or where excessive fume concentrations are present, gas masks with proper canister or supplied-air respirators are provided.

MISCELLANEOUS COMPOUNDS

Carbon Monoxide

Description: Carbon monoxide is a colorless, odorless and tasteless gas.

Synonyms: CO.

Potential Occupational Exposures: Carbon monoxide is usually encountered in industry as a waste product of incomplete combustion of fossil fuels (Complete combustion produces carbon dioxide. The major source of carbon monoxide is the gasoline-powered internal combustion engine.

A partial list of occupations in which exposure may occur includes: Floorcoverers, Paint Makers, Painters, Abrasive Blasters and Drywall Tapers.

Permissible Exposure Limits: The present Federal standard is 50 ppm (55 mg/m³). The standard recommended by NIOSH is 35 ppm with a ceiling value of 200 ppm. This latter value is to limit carboxyhemoglobin formation to five percent in a nonsmoker engaged in sedentary activity at normal altitude.

Route of Entry: Inhalation of gas.

Harmful Effects

Local—None.

Systemic—Carbon monoxide combines with hemoglobin to form carboxyhemoglobin which interferes with the oxygen-carrying capacity of blood and results in oxygen starvation. The typical signs and symptoms of acute carbon monoxide poisoning are headache, dizziness, drowsiness, nausea, vomiting, collapse, coma and death. Initially the victim is pale; later the skin and mucous membranes may be cherry-red in color. Loss of consciousness occurs at about the 50 percent carboxyhemoglobin level. The amount of carboxyhemoglobin formed depends on concentration and duration of carbon monoxide exposure, ambient temperature, health and metabolism of the individual. The formation of carboxyhemoglobin is a reversible process. Recovery from acute poisoning usually occurs unless oxygen starvation was severe enough to result in brain cell degeneration.

Carbon monoxide at low levels may initiate or enhance heart disease in individuals with restricted coronary artery blood flow and decreased myocardial lactate production.

Medical Surveillance: Check for cardiovascular disease and any medical conditions which could be worsened by exposure to carbon monoxide. Heavy smokers may be at greater risk. Methylene chloride exposure may also cause an increase of carboxyhemoglobin. Smokers usually have higher levels of carboxyhemoglobin than nonsmokers (often five to ten percent or more).

Special Tests: Carboxyhemoglobin levels are reliable indicators of exposure and hazard.

Personal Protective Methods: Under certain circumstances where carbon monoxide levels are not exceedingly high, gas masks with proper canisters can be used for short periods but are not recommended. In areas with high concentrations, self-contained breathing apparatus is recommended.

Sodium Hydroxide/Potassium Hydroxide

Description: Sodium hydroxide is a white material sold as pellets, flakes, lumps or sticks. Liquid solutions are known as soda lye.

Potassium hydroxide is white or slightly yellow lumps, rods, or pellets. Liquid solutions are known as lye.

Synonyms: Sodium hydroxide: caustic soda, caustic alkali, caustic flakes, sodium hydrate.

Potassium hydroxide: potassium hydrate, caustic potash, potassa, caustic alkali.

Potential Occupational Exposures: Sodium and potassium hydroxide is used in the manufacture of inks, in paint and varnish removers.

A partial list of occupations in which exposure may occur includes: Paint Remover Makers and Users and Varnish Remover Makers and Users.

Permissible Exposure Limits: The Federal standard for sodium hydroxide is 2 mg/m³. There is no standard for potassium hydroxide.

Route of Entry: Inhalation of dust or mist.

Harmful Effects

Local—Both compounds are extremely alkaline in nature and are very corrosive to body tissues. Dermatitis may result from repeated exposure to dilute solutions in the form of liquids, dusts or mists.

Systemic—Systemic effects are due entirely to local tissue injury. Extreme pulmonary irritation may result from inhalation of dust or mist.

Medical Surveillance: Check the skin, eyes and respiratory tract.

Special Tests: None.

Personal Protective Methods: Impervious protective clothing, rubber boots, face and eye shields and dust and mist respirators provides protection. All skin area burns, especially of the eyes, demand immediate care by flooding with large quantities of water for 15 minutes or longer and specialized medical care.

Sulfuric Acid

Description: Concentrated sulfuric acid is a colorless, odorless, oily liquid which is commercially sold at 93 to 98 percent H_2SO_4, the remainder being water. Fuming sulfuric acid (oleum) gives off free sulfur trioxide and is a colorless or slightly colored, viscous liquid.

Synonyms: Oil of vitriol, spirit of vitriol, spirit of sulfur, hydrogen sulfate.

Potential Occupational Exposures: Sulfuric acid is used as a chemical feedstock in the manufacture of paint.

A partial list of occupations in which exposure may occur includes: Paint Makers.

Permissible Exposure Limits: The Federal standard for sulfuric acid is 1 mg/m³.

Route of Entry: Inhalation of mist.

Harmful Effects

Local—Burning and charring of the skin are a result of sulfuric acid exposure. Concentrated sulfuric acid will effectively remove the elements of water from any organic materials with which it comes in contact. It is even more rapidly injurious to mucous membranes and exceedingly dangerous to the eyes. Ingestion causes serious burns of the mouth or perforation of the esophagus or stomach. Dilute sulfuric acid does not possess this property, but is an irritant to skin and mucous membranes due to its acidity and may cause irreparable eye damage and blindness as well as scarring of the eyelids and face.

Systemic—Sulfuric acid mist exposure causes irritation of the mucous membranes, eyes and respiratory tract. The mist also causes etching of dental enamel followed by erosion of enamel and dentine with loss of tooth substance. Breathing high concentrations of sulfuric acid causes tickling in the nose and throat, sneezing, and coughing. At lower levels sulfuric acid causes breathing to become fast and shallow; tightened bronchial tubes also make breathing difficult. A single overexposure may lead to laryngeal, tracheobronchial, and pulmonary edema. Repeated excessive exposures over long periods have resulted in bronchitic symptoms and running nose, tears and nose bleeds. Long exposures are claimed to result in eye irritation, frequent respiratory infections, emphysema and digestive disturbances.

Medical Surveillance: Check the skin, eyes, teeth, and respiratory tract. Pulmonary function tests should be performed.

Special Tests: None commonly used.

Personal Protective Methods: In all areas where liquid sulfuric acid is handled, impervious clothing should be provided, including gloves, goggles or face mask, rubber suits and rubber shoes. Any work clothing wetted by sulfuric acid is immediately changed and the skin area thoroughly washed and flooded with water. In areas where mist or gas is excessive, gas masks with appropriate canister or supplied-air respirators are provided. In either instance the worker should be supplied with full face protection.

Asbestos

Description: Fibrous material that is heat-proof, chemical resistent and almost indestructible.

Synonyms: Actmolite, amianthus, amosite, amphibole, anthophyllite, ascarite, chrysolite, crocidolite, tremolite.

Potential Occupational Exposure: Asbestos is widely used in a variety of goods. Many spackling compounds contain asbestos. Floor tiles are backed with asbestos or asbestos felt. Asbestos is also used as insulation.

A partial list of occupations in which exposure may occur include: Drywall Tapers, Painters and Floorcoverers.

Permissible Exposure Limit: The Federal standard for asbestos is 2 fibers/cubic centimeters of air with an acceptable ceiling level of 10 fibers/cubic centimeter of air.

The standard recommended by NIOSH is 0.1 fibers/cubic centimeter of air with the maximum ceiling at 0.5 fibers/cubic centimeter of air.

Route of Entry: Inhalation and ingestion of fibers.

Harmful Effects

Local—Lung irritation.

Systemic—Asbestosis, cancer. Cancer from asbestos exposure is eventually fatal.

Medical Surveillance: Preplacement and periodic examinations should include chest x-ray, lung function test and sputum cytology.

Special Tests: None.

Personal Protective Equipment: Dust mask or other appropriate respirator. Do not shake or blow clothing containing asbestos fibers. The clothing is deposited in a plastic bag for special cleaning.

Petroleum Spirits

Description: Colorless liquid.

Synonyms: Benzoline, mineral spirits, mineral thinner, mineral turpentine, painter's naphtha, refined solvent naphtha, solvent naphtha, varnish maker's naphtha, varnish and paint maker's naphtha, white spirit.

Potential Occupational Exposure: Petroleum spirits is used as a paint thinner and in mixing paints.

A partial list of occupations where exposure may occur includes: Paint Makers and Painters.

Permissible Exposure Limits: There is no Federal or recommended standard for petroleum spirits.

Route of Entry: Inhalation of vapor.

Harmful Effects

Local—Skin irritation, dermatitis.

Systemic—Central nervous system depressant; narcosis.

Medical Surveillance: Check the skin and nervous system.

Special Tests: None are known to be useful.

Personal Protective Equipment: Protection is provided by protective clothing and an organic vapor respirator. Barrier creams are also helpful to protect the skin.

Vinyl Acetate

Description:

Synonyms: Acetic acid, ethenyl ester, acetic acid, vinyl ester.

Potential Occupational Exposures: Vinyl acetate is used as a base for many latex paints.

A partial list of occupations in which exposure may occur includes: Paint Makers and Painters.

Permissible Exposure Limits: The Federal standard is 10 ppm.

Route of Entry: Inhalation of vapor.

Harmful Effects

Local—Skin irritant.

Systemic—At high concentrations vinyl acetate is a narcotic.

Medical Surveillance: Unknown.

Special Tests: Unknown.

Personal Protective Equipment: In areas of high concentrations of vinyl acetate an organic vapor respirator should be provided. Protective clothing and barrier creams are also used.

Silica

Description: Small granular or crystalline material.

Synonyms: Sand, silicon dioxide, flint, glass, SiO_2.

Potential Occupational Exposure: Silica is used as an abrasive during sandblasting and as a constituent in many drywall compounds.

A partial list of occupations in which exposure may occur include: Abrasive Blasters, Drywall Tapers and Painters.

Permissible Exposure Limits: The Federal standard for silica is $\frac{10\ mg/m}{\%SiO_2 + 2}$

The recommended standard is 0.05 mg/m^3.

Route of Entry: Inhalation of airbone dust.

Harmful Effects

Local—Silica is an irritant to the respiratory tract. Exposure to silica can sometimes be determined by a sandy or gritty taste in the mouth.

Systemic—Long-term exposure to silica will cause silicosis, which is irreversible. Silicosis restricts breathing, causes coughing and may lead to chronic bronchitis, emphysema, and heart attacks.

Medical Surveillance: Check lung function test and chest x-ray.

Special Tests: Unknown.

Personal Protective Equipment: Air-fed helmet for abrasive blasters, otherwise a dust mask will suffice for exposure to low concentrations of silica.

APPENDIX II

The table below contains the lower and upper explosive limits tor various solvents used in the paint and allied trades.

Solvent	Lower Explosive Limit	Upper Explosive Limit	Solvent	Lower Explosive Limit	Upper Explosive Limit
Acetone	2.6	12.8	Methyl alcohol	7.3	
iso-Amyl acetate	1.0′		Methyl cellosolve	2.5	
n-Amyl acetate	1.2		Methyl ethyl ketone	1.8	11.0
iso-Amyl alcohol	1.2		Methyl iso-butyl ketone	1.2	9.0
Benzene	1.4′	8.0	Methyl n-propyl ketone	1.5	
n-Butyl acetate	1.7		Methylene chloride	*	
n-Butyl alcohol	1.4	11.2	Mineral spirits	0.7	6.0
Butyl Cellosolve	1.1		Naphtha (VM & P)		
Carbon tetrachloride	*		(76° Naphtha)	0.8	6.0
Cellosolve	1.8	16.0	Naphtha (100° flash) safety		
Cellosolve acetate	1.7		solvent-Stoddard solvent	1.1	
Cyclohexane	1.3	8.0	n-Propyl acetate	2.0	
Cyclohexanone	1.1′		iso-Propyl acetate	1.8	
1,1 Dichloroethylene	5.6		n-Propyl alcohol	2.1	
1.2 Dichloroethylene	9.7		iso-Propyl alcohol	2.0	12.0
Ethyl acetate	2.5		Toluene	1.4	6.7
Ethyl alcohol	3.3	19.0	Trichloroethylene	*	
Ethyl acetate	1.5′		Turpentine	0.8	None
Methyl acetate	3.1		Xylene	1.0	5.3

* Non-flammable.

NOTE: All lower explosive limits are in percent by volume of air at 70°F unless noted by a [1] in which case it is at 212°F.

PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment for painters and allied tradesworkers is the most important hazard control because other control measures are not always feasible or have not been instituted. All personal protective equipment should be selected according to its ability to do the job—that is, protect you from hazards.

In addition, the personal protective equipment must be adequately maintained to retain its effectiveness. If damaged, the equipment should either be repaired, if possible, or replaced. Don't use defective equipment, it only gives you a false sense of security. One measure of the ability of personal protective equipment to get the job done is the NIOSH/MSHA approval. Only equipment approved by NIOSH/MSHA should be used—look for the NIOSH/MSHA approval label.

Eye Protection

Table I is a list of different eye protective devices. Table II is a guide to when the eye protective devices must be used. Read down the column labelled "Operation." When you find an operation that you perform, read across and determine the hazard associated with the operation. After the hazard is determined, read across and find the number(s) corresponding to the appropriate eye protective device listed in Table I. Then, whenever you perform the operation listed in the first column, use the appropriate eye protective device.

Table I—Eye Protection
Types of Eye Protectors

1. Goggles, flexible fitting, regular ventilation
2. Goggles, flexible fitting, hooded ventilation
3. Goggles, cushioned fitting, rigid body
4. Spectacles, metal frame, with sideshields
5. Spectacles, plastic frame, with sideshields
6. Spectacles, metal-plastic frame, with sideshields
7. Welding goggles, eyecup type, tinted lenses

7a. Chipping goggles, eyecup type, clear safety lenses
8. Welding goggles, coverspec type, tinted lenses
8a. Chipping goggles, coverspec type, clear safety lenses
9. Welding goggles, coverspec type, tinted plate lense
10. Faceshield
11. Welding helmets

Table II—Selection of Eye Protection

Operation	*Hazard*	*Protection*
Acetylene-burning	Harmful rays, sparks	7, 8, 9
Acetylene-cutting	Molten metal	7, 8, 9
Acetylene-welding	Flying particles	7, 8, 9
Chemical handling	Splash, acid burns, fumes	2, 10, for severe exposure use 10 over 2
Chipping	Flying particles	1, 3, 4, 5, 6, 7a, 8a
Electric (arc) welding	Sparks, intense rays, molten metal	9, 11 (11 in combination with 4, 5, 6 tinted lenses is advisable)
Furnace operations	Glare, heat, molten metal	7, 8, 9 (for severe exposure add 10)
Grinding (light)	Flying particles	1, 3, 4, 5, 8, 10
Grinding (heavy)	Flying particles	1, 3, 7a, 8a (for severe exposure add 10)
Laboratory	Chemical splash, glass breakage	2 (10 when in combination with 4, 5, 6)
Machining	Flying particles	1, 3, 4, 5, 6, 10
Molten metals	Heat, glare, sparks, splash	7, 8 (10 in combination with 4, 5, 6 in tinted lenses)
Spot welding	Flying particles, sparks	1, 3, 4, 5, 6, 10

Source: OSHA Standards, 29 CFR 1926.101.

Respirators

Respirators are very important personal proetctive devices for painters and allied tradesworkers. Vapors from organic solvents used in many paint and allied products, mists from spray painting and dusts from abrasive blasting and sanding all pose serious inhalation hazards to workers in the paint trades. Proper respirator selection is extremely important. Too often an improper respirator, such as a dust mask, is used for a particular hazard, such as organic vapors from solvents.

By going through the respirator selection process following, you can possibly determine if you are using an improper respirator. Even if you don't have all the necessary information, you can still proceed through the selection process and make a partial determination if you are using an improper respirator.

Respirator Selection

I. What is the *Nature* of the hazard?

A. Is the hazard due to a deficiency of oxygen? If yes, then use either 1) self-contained breathing apparatus (SCBA), or 2) a combination air-line respirator with an auxiliary SCBA. Do not go on.
B. Is the hazard a physical substance? If yes, then go on to II.

II. Does the substance cause *eye irritation*?

A. If yes, then eliminate use of quarter and half mask. Go on to III.
B. If no, then go on to III.

III. What is the *physical state* of the substance?

A. If the substance is a particulate (dust, spray, fume, mist, fog or smoke), eliminate use of gas and vapor removing air-purifying respirator. Go on to V.
B. If the substance is a gas or vapor, eliminate use of particulate removing air-purifying respirators. Go on to IV.

IV. Does the gas or vapor have *warning properties* at or below the permissible exposure limit?

A. If yes, then go on to V.
B. If no, then eliminate use of gas and vapor removing air-purifying respirator. Go on to V.

V. What is the *concentration* of the substance?

A. If the concentration is at or above the level immediately dangerous to life and health or the lower flammable limit, then use 1) positive pressure, full facepiece SCBA or 2) combination positive pressure, full facepiece airline respirator with an auxiliary SCBA. Do not go on.
B. If the concentration is below the level immediately dangerous to life and health or the lower flammable limit, go to table III if substance is a particulate or table IV if the substance is a gas or vapor.

VI. Can the substance be absorbed by the skin?

A. If yes, then other protective clothing, such as air-fed suits, must be worn. Do not go on.
B. If no, do not go on.

196

Table III—Particulates

Concentrations in Multiples of *Permissible Exposure Limit (PEL)*	*Permissible Respirator*
up to 5× PEL	Single use dust respirator
up to 10× PEL	Quarter-mask dust or fume respirator
	Quarter-mask respirator with high efficiency filter
	Half-mask supplied-air respirator
up to 50× PEL	Full-facepiece respirator with high-efficiency filter
	Full-facepiece supplied-air respirator
	Full-facepiece SCBA
up to 1000× PEL	Powered, high efficiency filter respirator
	Continuous-flow, half-mask supplied-air respirator
up to 2000× PEL	Pressure-demand, air-line respirator with full facepiece, hood, helmet, or suit
up to 10,000× PEL	Pressure-demand, SCBA with full facepiece
	Pressure-demand, air-line with full facepiece and auxiliary SCBA
Emergency entry into unknown concentrations	Pressure-demand SCBA with full facepiece

Source: OSHA's Industrial Hygiene Field Operations Manual, Chapter XII.

Table IV—Gases and Vapors

Concentrations in Multiples of *Permissible Exposure Limit (PEL)*	*Permissible Respirator*
up to 10× PEL	Half-mask, gas or vapor-removing respirator with appropriate cartridge or canister
	Half-mask, supplied-air
up to 50× PEL	Full-facepiece, gas or vapor removing respirator with appropriate cartridge or canister
	Full-facepiece SCBA
	Full-facepiece supplied-air
up to 1000× PEL	Continuous flow, half-mask, supplied-air
up to 2000× PEL	Continuous-flow, supplied-air with full-facepiece, hood, helmet or suit
up to 10,000× PEL	Pressure-demand SCBA with full facepiece
	Pressure-demand air-line respirator with full-facepiece and auxiliary SCBA
Emergency entry into unknown concentrations	Pressure-demand, full-facepiece SCBA

Source: OSHA's Industrial Hygiene Field Operations Manual, Chapter XII.

Notes for Tables III and IV

1. For appropriate cartridge or canister, see Table V.
2. A half-mask can be substituted for a quarter mask and a full facepiece can be substituted for both a half mask and a quarter mask. If this substitution is made, your margin of protection is increased.
3. The permissible respirator for "up to 50× PEL" can be substituted for the permissible respirators for "up to 10× PEL." This type of substitution increases your margin of protection.

Go on to VI.

Table V—Selection of Canisters

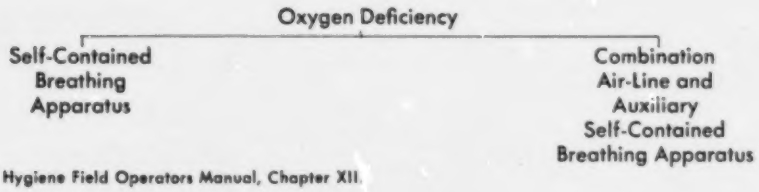
Atmospheric Contaminants *to be Protected Against* (Maximum use concentration, parts per million)	Color assigned to the *Appropriate Canister*
Acid gases	White
Hydrocyanic acid gases	White with ½ inch green stripe completely around the canister near the bottom
Chlorine gas (10)	White with ½ inch yellow stripe completely around the canister near the bottom
Organic vapors (1000)	Black
Ammonia gas (300)	Green
Acid gases and Ammonia gas	Green with ½ inch white stripe completely around the canister near the bottom
Carbon monoxide	Blue
Acid gases and organic vapors	Yellow
Hydrocyanic acid gas and chloropicrin vapor	Yellow with ½ inch blue stripe completely around the canister near the bottom
Acid gases, organic vapors and ammonia gases	Brown
Radioactive materials, except tritium and noble gases	Purple (magenta)
Particulates in combination with any of the above gases or vapors	Canister color for contaminant, as designated above, with ½ inch gray stripe around the canister near the top
All the above atmospheric contaminants	Red with ½ inch gray stripe completely around the canister near the top

NOTE: Maximum use concentrations are lower for organic vapors which produce atmospheres immediately dangerous to life and health at concentrations equal to or lower than the number in parenthesis.

Source: 29 CFR 1910.134(g)

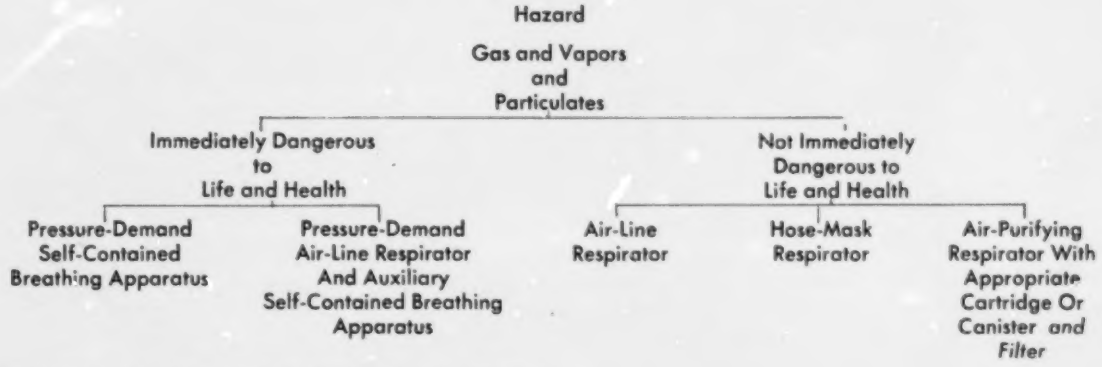
Tables VI, VII, VIII and IX are a graphic representation of the respirator selection process. These tables are useful for a quick determination of the proper type of respirator. In addition, tables X, XI, XII and XIII list NIOSH/MSHA approved respirators for abrasive blasting operations, painting operations, exposure to organic vapors and dusts respectively. These tables are useful to determine if the respiratory equipment you now use is: 1) appropriate and 2) approved by NIOSH/MSHA.

Table VI



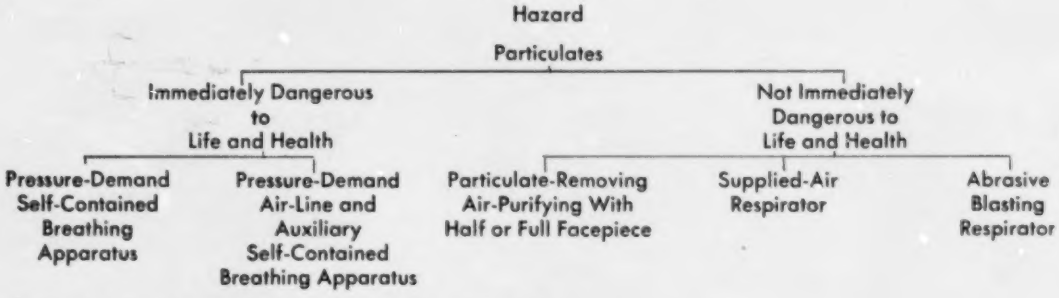
Source: OSHA's Industrial Hygiene Field Operators Manual, Chapter XII.

Table VII


Hazard
Gas and Vapors and Particulates
Immediately Dangerous to Life and Health
Not Immediately Dangerous to Life and Health
Pressure-Demand Self-Contained Breathing Apparatus
Pressure-Demand Air-Line Respirator And Auxiliary Self-Contained Breathing Apparatus
Air-Line Respirator
Hose-Mask Respirator
Air-Purifying Respirator With Appropriate Cartridge Or Canister and Filter

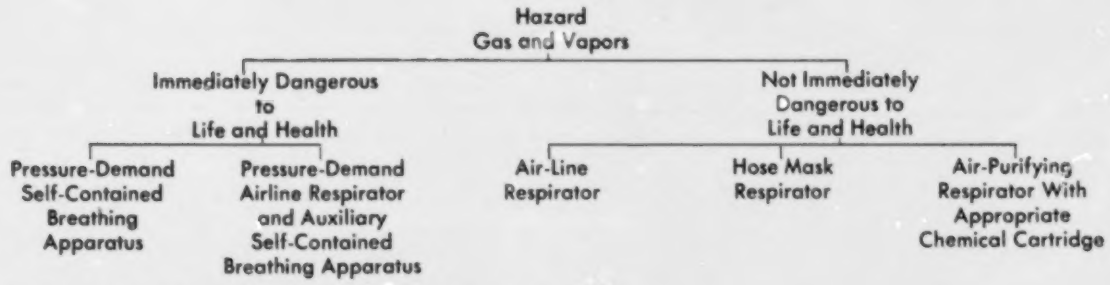
Source: OSHA's Industrial Hygiene Field Operators Manual, Chapter XII.

Table VIII


Hazard
Particulates
Immediately Dangerous to Life and Health
Not Immediately Dangerous to Life and Health
Pressure-Demand Self-Contained Breathing Apparatus
Pressure-Demand Air-Line and Auxiliary Self-Contained Breathing Apparatus
Particulate-Removing Air-Purifying With Half or Full Facepiece
Supplied-Air Respirator
Abrasive Blasting Respirator

Source: OSHA's Industrial Hygiene Field Operators Manual, Chapter XII.

Table IX


Hazard
Gas and Vapors
Immediately Dangerous to Life and Health
Not Immediately Dangerous to Life and Health
Pressure-Demand Self-Contained Breathing Apparatus
Pressure-Demand Airline Respirator and Auxiliary Self-Contained Breathing Apparatus
Air-Line Respirator
Hose Mask Respirator
Air-Purifying Respirator With Appropriate Chemical Cartridge

Source: OSHA's Industrial Hygiene Field Operators Manual, Chapter XII.

Table X

NIOSH/MSHA Approved Respirators for Abrasive Blasting Operations

The airline respirators listed below are NIOSH/MSHA approved for abrasive blasting operations. All the listed respirators are continuous flow and include an abrasive blasting helmet. Tampering with or substituting parts may void the NIOSH/MSHA approval. This list does not constitute endorsement of any respirator.

Respirator	*Model Numbers*	*NIOSH/MSHA Approval Number*
ANDERSON	46, 77	TC-19C-84
BOWEN TOOLS	46, 77	TC-19C-84
BULLARD	77-SH, 77-SH/M, 77-SACH, 77-SACHM	TC-19C-84
BULLARD	999-4, 999-5, 999-6	TC-19C-102
CESCO	PI-800	TC-19C-64
CESCO	801	TC-19C-96
CLEMCO	PCE	TC-19C-85
DEANE AND CO.	46, 77	TC-19C-84
EMPIRE	46, 77	TC-19C-84
ENCON	6400	TC-19C-79
KELCO	46, 77	TC-19C-84
MACHINE AND SUPPLY	46, 77	TC-19C-84
MSA	460907, 460908, 460909, 460910, 461713, 461714, 461715, 461716	TC-19C-81
PAULI AND GRIFFIN	46, 77	TC-19C-84
QUAKER STATE	46, 77	TC-19C-84
SANSTORM	46, 77	TC-19C-84
U.S. SAFETY	801	TC-19C-96
U.S. SAFETY	PI-800	TC-19C-64
3-M	W-810, W-840, W-856, W-858, W-870, W-275, W-280	TC-19C-69
3-M	W-820, W-880, W-881, W-888, W-890, W-276, W-281	TC-19C-87
3-M	W-270, W-271, W-272, W-274, W-277, W-282	TC-19C-70
3-M	W-251AD, W-265	TC-21C-137

Source: Cumulative Supplement, June 1977, NIOSH Certified Equipment, DHEW (NIOSH) Publication No. 77-195.

Table XI

NIOSH/MSHA Approved Respirators for Painting Operations

The chemical cartridge respirators listed below are NIOSH/MSHA approved for painting operations. These respirators, if properly fitted and maintained, will protect you from organic vapors, such as solvents, and mists of paints, enamels and lacquers. Generally, these respirators will be sufficient for most painting operations. However, painting in confined quarters may require additional protection, such as that provided by a positive-pressure airline respirator. To be sure, your employer should take periodic air samples to determine the vapor concentration. This list does not constitute an endorsement of any respirator.

Respirator	*Model Numbers*	*NIOSH/MSHA Approval Number*
AMERICAN OPTICAL	R5051P	TC-23C-94
AMERICAN OPTICAL	R6051P	TC-23C-95
AMERICAN OPTICAL	R8151P	TC-23C-93
AMERICAN OPTICAL	R8191P	TC-23C-92
AMERICAN OPTICAL	R5091P	TC-23C-97
AMERICAN OPTICAL	R6091P	TC-23C-98
ACME AUTOMOTIVE FINISHES	27	TC-23C-75
BINKS	40-128	TC-23C-87
CESCO	95RC35	TC-23C-126
COVER	1482-G100-F102	TC-23C-124
DEVILBISS	MSP-505	TC-23C-96
EASTERN	E454	TC-23C-124
FIBER METAL	C-251	TC-23C-100
GLENDALE	6R2021-20	TC-23C-90
MSA	461846	TC-23C-149
MSA	448849, 462241, 460853	TC-23C-80
NORTHCOTT	70-450	TC-23C-128
NORTON	7531, 7531M	TC-23C-75
PULMOSAN	C-251	TC-23C-100
SELLSTROM	315-G100-F102	TC-23C-124
SCOTT	604032-00, 6411-2213, 6413-2213, 6411-3213	TC-23C-117
STEWART-WARNER	7931	TC-23C-127
U.S. SAFETY	150T24	TC-23C-125
WILSON	162115, 172115	TC-23C-133
WILSON	1221	TC-23C-50
WILSON	122115	TC-23C-54

Powered Air Purifiers and Airline Respirators

BULLARD	999-3, 999-4, 999-5, 999-6	TC-19C-102
3-M	W-870	TC-19C-69
3-M	W-880	TC-19C-70
3-M	W-270	TC-19C-87
3-M	W-250AD, W-260	TC-21C-136A

Source: Cumulative Supplement, June 1977, NIOSH Certified Equipment, DHEW (NIOSH) Publication No. 77-195.

Table XII

NIOSH/MSHA Approved Respirators for Organic Vapors from Solvents

The chemical cartridge respirators listed below are NIOSH/MSHA approved for organic vapors from many solvents. These respirators are not necessarily approved for protection against paint spray operators. This list does not constitute endorsement of any respirator.

Respirator	*NIOSH/MSHA Approval Number*
Acme Automotive Finishes 27	TC-23C-75
American Optical R5051	TC-23C-56
American Optical R6051	TC-23C-57
American Optical R5053, R6053	TC-23C-82
American Optical R5055, R6055	TC-23C-83
American Optical R8151	TC-23C-84
American Optical R8153	TC-23C-85
American Optical R8191P	TC-23C-92
American Optical R8151P	TC-23C-93
American Optical R5051P	TC-23C-94
American Optical R6051P	TC-23C-95
American Optical R5091P	TC-23C-97
American Optical R6091P	TC-23C-98
Binks 40-129	TC-23C-86
Binks 40-128	TC-23C-87
Cesco 94R40	TC-23C-99
Cesco 95RL25	TC-23C-119
Cesco 95RL45	TC-23C-121
Cesco 95RL35	TC-23C-126
Cover 1482-G100	TC-23C-107
Cover 1482-G100-F102	TC-23C-124
Cover 1482-G104	TC-23C-163
Norton 75BP03	TC-23C-104
Norton 75BP13	TC-23C-105
Pulmosan C256	TC-23C-81
Pulmosan C259	TC-23C-91
Pulmosan C251	TC-23C-91
Safe-Tex 236-G100	TC-23C-107
Sellstrom 215-G100-F102	TC-23C-124
Sellstrom 315-G100	TC-23C-107
Scott 604022-13, 6411-2013, 6411-3013, 6413-2013, 6413-3013	TC-23C-113
Scott 604032-13, 6411-2113, 6411-3113, 6413-2113, 6413-3113	TC-23C-114
Scott 604032-00, 6411-2213, 6411-3213, 6413-2213, 6413-2313	TC-23C-117
Steward-Warner 7931	TC-23C-127
U.S. Safety 150T24	TC-23C-125
U.S. Safety 158T23	TC-23C-120
U.S. Safety 150T20	TC-23C-118
Willson 1221	TC-23C-50
Willson 122110	TC-23C-51
Willson 122113	TC-23C-52
Willson 122115	TC-23C-52
Willson 1225	TC-23C-86
Willson 122510	TC-23C-77
Willson 1621, 1721	TC-23C-130
Willson 162113, 172113	TC-23C-131
Willson 162115, 172115	TC-23C-133
Willson 162110, 172110	TC-23C-134
Willson 1625, 1725	TC-23C-141
Willson 162510, 172510	TC-23C-142
3-M 8712	TC-23C-123
3-M 8716	TC-23C-200
3-M 8725	TC-23C-216

Source: Cumulative Supplement, June 1977, NIOSH Certified Equipment, DHEW (NIOSH) Publication No. 77-195.

202

Table XIII

NIOSH/MSHA Approved Respirators for Dusts, including Asbestos

The respirators listed below are NIOSH/MSHA approved for protection against dusts including asbestos (except where marked by an asterisk (*). This list does not constitute endorsement of any respirator.

Respirator	*NIOSH/MSHA Approval Number*	*Respirator*	*NIOSH/MSHA Approval Number*
American Optical R5030	TC-21C-144	MSA 459438, 461011	TC-21C-134
American Optical R6030	TC-21C-145	MSA 96000, 457344*	TC-21C-138
American Optical R5056, R6056	TC-21C-161	MSA 461683*	TC-21C-156
American Optical R8100*	TC-21C-162	MSA 460357*	TC-21C-159
American Optical R2090N*	TC-21C-166	MSA 462240*	TC-21C-181
American Optical R8156	TC-21C-169	MSA 461847	TC-21C-187
Cesco 94R20	TC-21C-163	MSA 461845	TC-21C-188
Cesco 95RC15	TC-21C-180	Norton 7506, 7506M	TC-21C-151
Cover 1482-F100	TC-21C-154	Norton 7406L, 7406LM	TC-21C-153
DeVilbiss MSC-507*	TC-21C-167	Norton 7170*	TC-21C-170, 170A
Eastern E-450	TC-21C-154		
Glendale* GR1000, GR3000	TC-21C-172	3-M 8710	TC-21C-132
Glendale* GR7000, GR4000	TC-21C-164	3-M 9900	TC-21C-176
Glendale* GR2026	TC-21C-189	3-M 9910	TC-21C-190
MSA 459440	TC-21C-133		

Source: Cumulative Supplement, June 1977, NIOSH Certified Equipment, DHEW (NIOSH) Publication No. 77-195.

After the proper respirator has been selected, you must properly fit it to your face. Follow the manufacturer's procedures. Once the respirator is on, you must then perform the positive or negative pressure leak check (this cannot be done with dust masks, or loose fitting hoods and helmets). The procedures to perform a leak check are contained in the manual under personal protective equipment. By performing the leak checks and readjusting the respirator, you can assure yourself of a good tight fit.

Finally, after properly selecting and fitting the respirator, it must be continually maintained to remain effective. Too many times defective equipment is used, causing illnesses among workers. The manufacturer's procedures for maintaining, cleaning and inspecting should be followed. In addition, Table XIV lists four basic categories of care and maintenance of respirators that should be followed.

Table XIV

Four Categories of Care and Maintenance of Respirators

I. Inspection for defects

A. Tightness of connections
B. Condition of regulator, if there is one
C. Condition of facepiece, headbands, valves, connecting tube, filter, cartridge or canister
D. Condition of rubber parts

II. Cleaning and disinfecting

A. Remove all filters, cartridges, or canisters
B. Wash facepiece and breathing tube in proper solution
C. Rinse completely in warm water
D. Air dry in clean area
E. Clean other parts as the manufacturer recommends
F. Inspect for damage and replace damaged parts
G. Install new filter, cartridge or canister

III. Repair

A. Repair any parts damaged or defective

IV. Storage

A. Store in plastic bag or proper container after cleaning and repairing
B. Store away from dust, sunlight, heat, cold, excessive moisture, or harmful chemicals

Proper selection, maintenance and care of all personal protective equipment, including respirators, will greatly increase your chances of working without injuries and illnesses and collecting your pension as a healthy person.

APPENDIX III

Employee Rights and Responsibilities

The Occupational Safety and Health Act of 1970 is an important law protecting workers from safety and health hazards on the job. The following information supplements the text of this manual. Included are tables and charts answering:

Who is covered by the OSH Act?
How is the OSH Act administered?
How is NIOSH administered?
How is OSHA administered?
How is NIOSH organized?
How is OSHA organized?
How does OSHA set and revise its standards?
How does OSHA work with others to fullfill its goal?
How do I initiate an OSHA inspection?
What rights do I have during an OSHA inspection?
What happens after the inspection?
Where do I contact the correct OSHA representative?
Which states have approved occupational safety and health plans under Section 18 of the Occupational Safety and Health Act of 1970?
What does a U.S. Department of Labor, OSHA complaint form look like?
How do I recognize a Citation and Notification of Penalty from OSHA?
How do I recognize a De Minimis Notice from OSHA?
What is included in the OSHA form Notification of Failure to Correct Alleged Violation and of Proposed Additional Penalty?
What is included in the OSHA form NOTICE of Alleged Imminent Danger (to Employer(s) and Employees)?
How does OSHA protect me from discrimination?
Who should I contact for a Health Hazard Evaluation of my work site?
How does OSHA inspection and investigation proceed?

Table I

Who Is Covered by the OSH Act?

Industry	*Number of Workers Covered*	*Industry*	*Number of Workers Covered*
Agriculture	1,500,000	Wholesale and Retail Trade	17,000,000
Construction	4,000,000	Finance, Insurance and Real Estate	4,000,000
Manufacturing	20,000,000	Services	13,000,000
Transportation and Public Utilities	4,500,000	Total	64,000,000

Table II

How Is the OSH Act Administered?

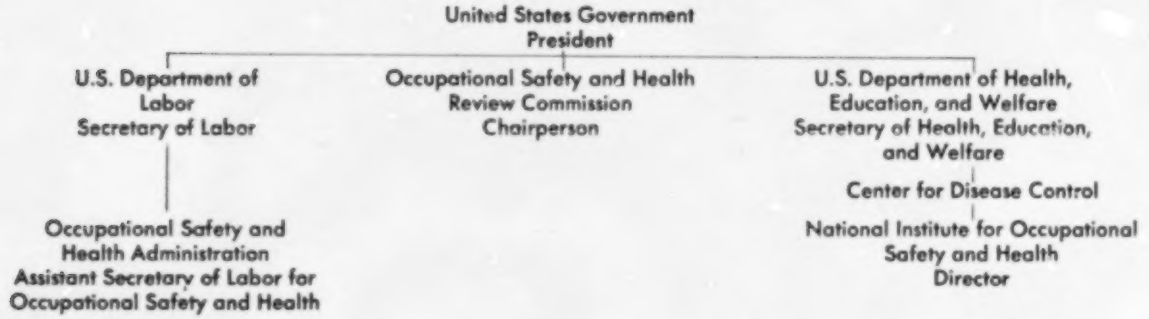

United States Government
President
U.S. Department of Labor
Secretary of Labor
Occupational Safety and Health Review Commission
Chairperson
U.S. Department of Health, Education, and Welfare
Secretary of Health, Education, and Welfare
Center for Disease Control
Occupational Safety and Health Administration
Assistant Secretary of Labor for Occupational Safety and Health
National Institute for Occupational Safety and Health
Director

Table III

How Is NIOSH Organized?

National Institute for Occupational Safety and Health
Director

Division of Laboratories for Criteria Development	Division of Field Studies and Clinical Investigations	Division of Technical Services	Division of Training	Division of Occupational Health Programs	Appalachian Laboratory for Occupational Respiratory Diseases

Regional Offices

Region 1 Boston	Region 2 New York City	Region 3 Philadelphia	Region 4 Atlanta	Region 5 Chicago
Region 6 Dallas	Region 7 Kansas City	Region 8 Denver	Region 9 San Francisco	Region 10 Seattle

Table IV

How Is OSHA Organized?

Occupational Safety and Health Administration
Assistant Secretary of Labor for Occupational Safety and Health

Health Standard Programs	Safety Standards Programs	Administrative Programs	Federal Compliance and State Programs	Training Education, Consultation and Federal	Technical Support Programs

Regional Offices

Region 1 Boston	Region 2 New York City	Region 3 Philadelphia	Region 4 Atlanta	Region 5 Chicago
Region 6 Dallas	Region 7 Kansas City	Region 8 Denver	Region 9 San Francisco	Region 10 Seattle

Table V

How Does OSHA Set and Revise Its Standards?

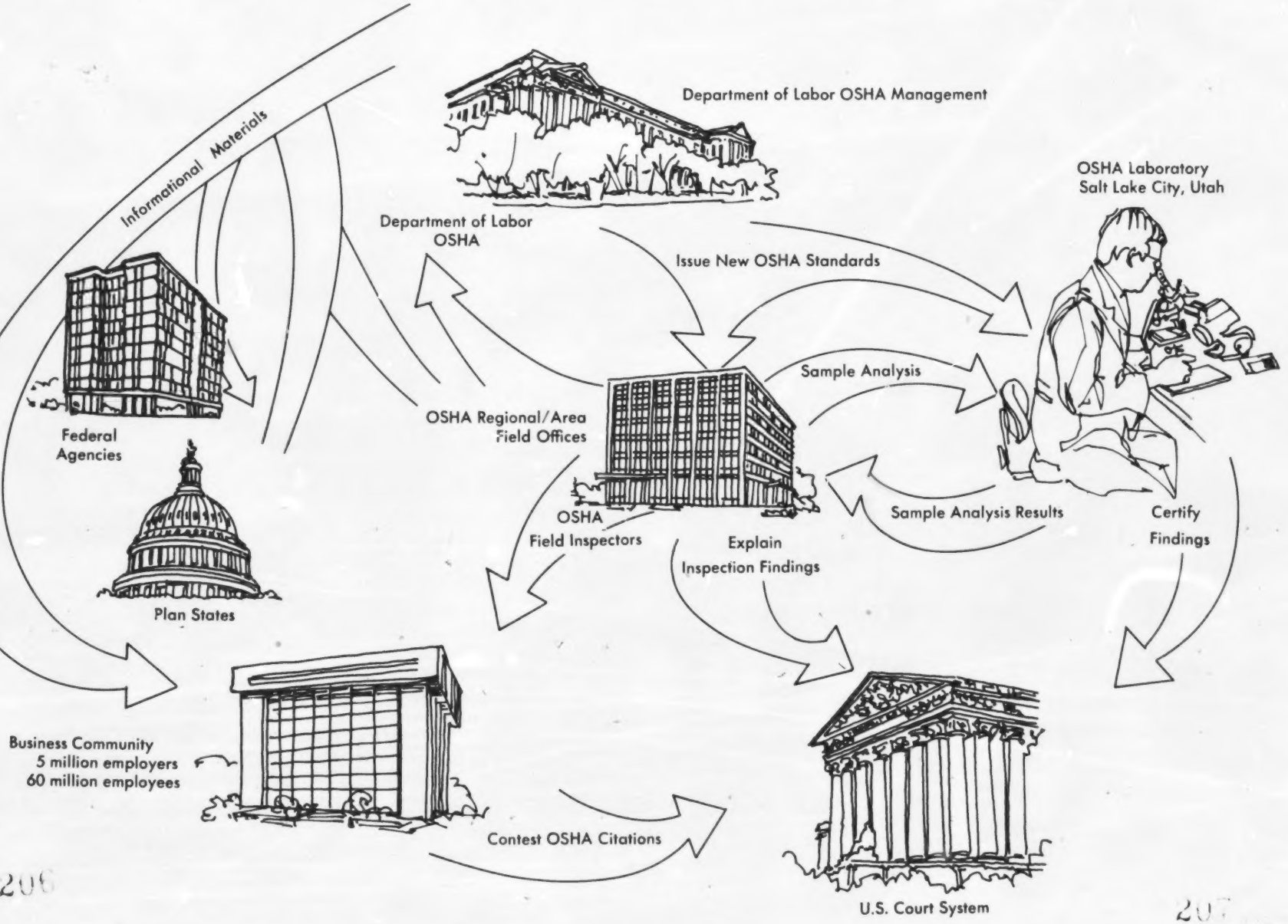
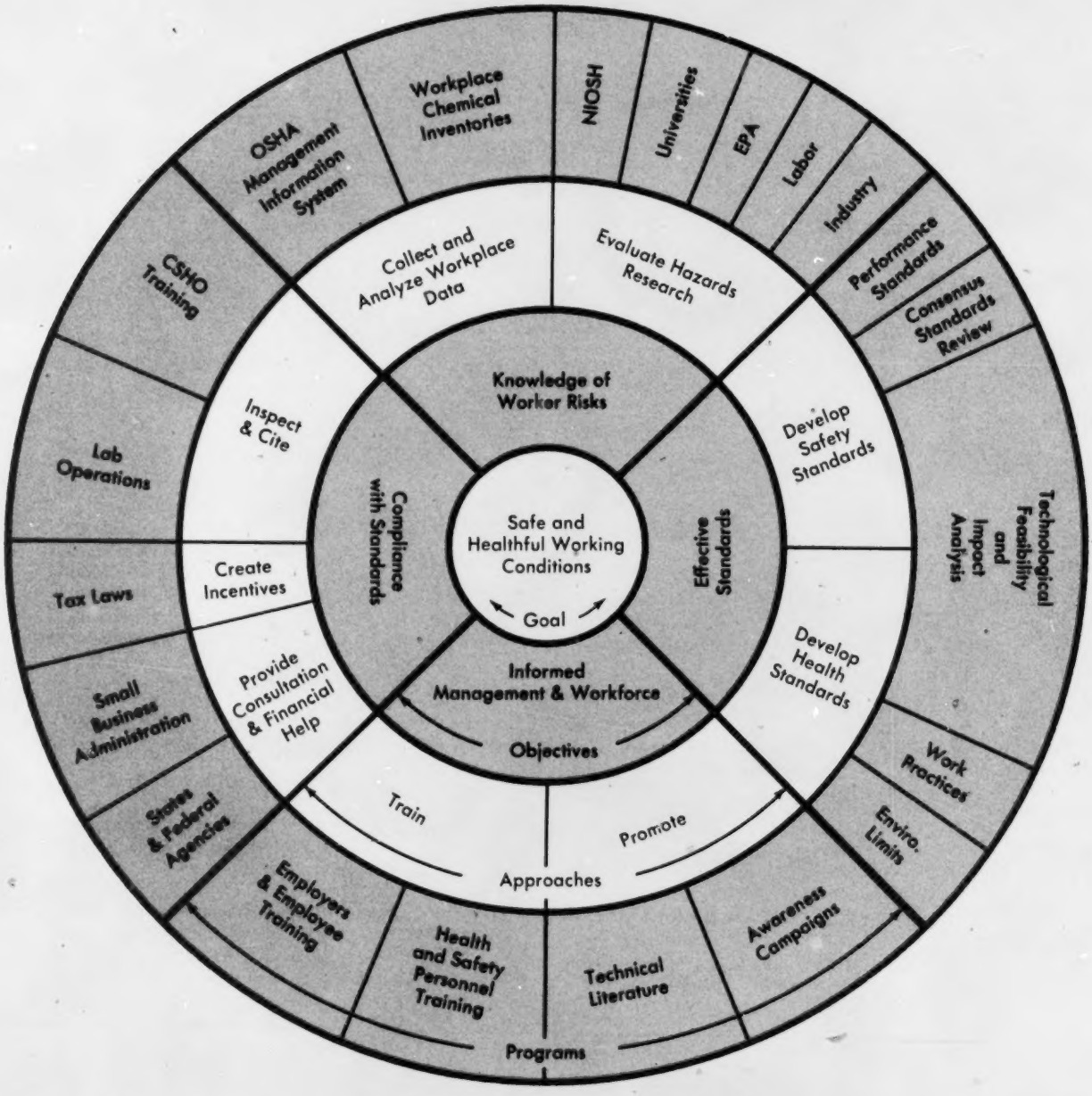


Table VI

How Does OSHA Work with Others to Fullfill Its Goal?



205

How Do I Initiate an OSHA Inspection?

Q. When should I request an OSHA inspection?

A. When a hazard exists and other procedures to eliminate the hazard have been exhausted, an OSHA inspection should be requested. Other procedures to eliminate the hazard include notifying your supervisor and notifying your steward.

Q. Who may make a complaint?

A. Any employee or employee representative, including a member of your family and your union representative.

Q. To whom is the complaint made?

A. To any compliance safety and health officer or the Area Director nearest you. (See Table VIIi). If you live in a state with an approved OSH plan, write your complaint to the individual in charge of administering the state OSH program. (See Table IX)

Q. How do I make the complaint?

A. The complaint should state that a violation exists in your workplace. It should cite what the hazardous condition is and the dangers it presents, and the name and address of your employer. The complaint must be signed by at least one employee or an employee representative. (See Table X)

Q. Will the employer know who made the complaint?

A. No, if you *specifically request* that you remain anonymous. Otherwise, when OSHA gives your employer a copy of the complaint, your name will be on it.

Q. Must OSHA always make an inspection of the workplace after I filed a complaint?

A. No. OSHA will not conduct an inspection if the complaint fails to meet the "formality requirements." If your complaint does not meet the formality requirements, you will be sent a notice by OSHA specifying which requirements were not met. You must then submit a new complaint. Complaints meeting the formality requirement are judged by the OSHA Area Director to determine if there are reasonable grounds for believing an alleged violation or dangerous condition does exist. If such grounds exist, an inspection will be scheduled as soon as practicable. A complaint alleging an imminent danger condition will initiate an inspection if OSHA judges it to be valid, even though it may not meet the formality requirements.

Q. Will I find out the result of the OSHA inspection?

A. Yes, you will learn the result of an OSHA inspection. If a citation is issued, it must be posted by your employer. If a citation is not warranted, you will receive such notification in writing and you will also receive information regarding your right to review the decision not to issue a citation.

Q. What do I do if OSHA decides not to make an inspection pursuant to my complaint?

A. You will receive written notice from OSHA stating the reason they decided not to initiate an inspection. You will also be informed that you may obtain an informal review of the Area Director's determination. In order to obtain an informal review, you must submit a written statement of your position to the Assistant Regional Director. A copy of your position must be sent to the employer by certified mail. If the employer files an opposing statement, the employer must send you a copy by certified mail. If the Assistant Regional Director decides an informal conference is to be held, you and your employer (if your employer decides to attend) will present oral views. The Assistant Regional Director will then make a decision which will be final and not subject to further review. You will receive a copy of the Assistant Regional Director's decision with the reasons for reaching it. At this point you will have exhausted all avenues for relief under the OSH Act.

Table VII

How Does OSHA Inspection and Investigation Proceed?

U.S. DEPARTMENT OF LABOR

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

INSPECTION/INVESTIGATION FLOW CHART

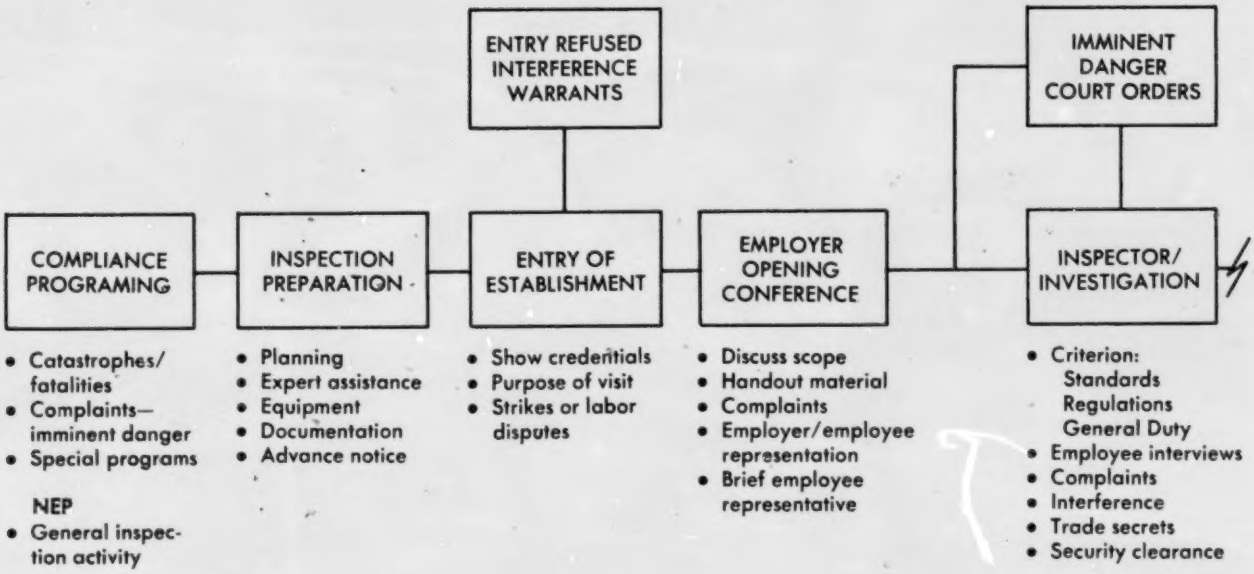
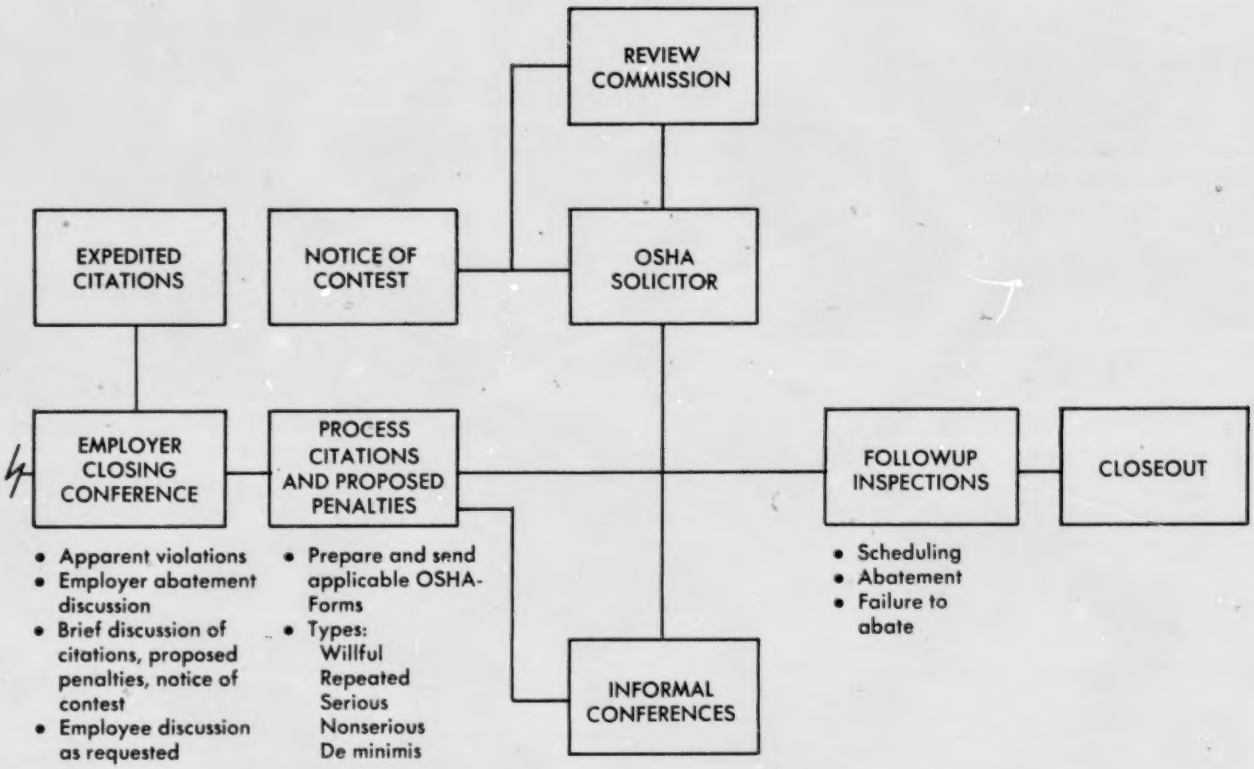


Table VIII

INSPECTION/INVESTIGATION FLOW CHART



What Rights Do I Have During an OSHA Inspection?

Q. May I notify the Occupational Safety and Health Compliance Officer of any violations at the time of inspection?

A. Yes. You may informally notify the OSHA compliance officer, but an informal notice does not entitle you to the right of review if no citation is issued. However, if you write down the violation and it meets the formality requirements of a complaint requesting an inspection, your rights to review will be preserved.

Q. Do I have the right to accompany the OSHA Compliance Officer during physical inspection of the workplace?

A. Your representative, usually your Business Agent, has the right to accompany the OSHA Compliance Officer. Your BA should make sure the OSHA Compliance Officer inspects all important areas of the workplace and points out conditions that could possibly cause harm to you or your co-workers. If your BA cannot accompany the OSHA Compliance Officer then the Compliance Officer *must* consult with a reasonable number of workers, who may also point out hazards. Even if your BA is accompanying the OSHA Compliance Officer, you may still point out hazards to the Compliance Officer.

Q. I work on a construction site where there are several unions and employers. Which employee representative has the right to accompany the OSHA Compliance Officer?

A. They all do. This may be accomplished in two ways. First, all the employees at the work site may select a limited number of representatives to accompany the OSHA compliance Officer during the walk-through. Second, while passing through each different area of the worksite, the OSHA Compliance Officer may be accompanied by a separate employee representative. For example, when inspecting the painting operation, the OSHA Compliance Officer should be accompanied by a representative of IBPAT, and when inspecting the sheet metal work, the OSHA Compliance Officer should be accompanied by a representative of the Sheet Metal Workers

Q. Do I have the right to have a *private* interview with the OSHA Compliance Officer?

A. Yes. The OSHA Compliance Officer may hold a private interview with you at a time that will interfere the least with the employer's operation. In some cases this may mean during your break or lunch period. If necessary, the OSHA Compliance Officer will even interview you in your own home.

Q. Does my representative have the right to a closing conference with the OSHA Compliance Officer?

A. Yes, but only if your representative specifically requests one. The OSHA Compliance Officer will attempt to answer any questions your representative may have and will explain the citation, penalty and abatement procedure.

What Happens After the Inspection?

Q. Will the OSHA Compliance Officer issue my employer a citation for violations (if there are any) immediately after the inspection?

A. Usually not. The standard procedure is for the OSHA Compliance Officer to return to the office, consult with the necessary personnel, complete the citation form and then the Area Office will mail out the citation. Your employer may at the time of receipt of the citation, or later, be sent a notice of proposed penalties for the violations found.

Q. Do I have the right to see the citation?

A. Yes. Your employer must post a copy of the citation where the employees are required to report on a daily basis. The citation must remain posted for three days or however long it takes the employer to correct the violations, whichever is longer. Your employer must also make sure the citation is not altered, defaced or covered up. (See Tables XI and XII.)

Q. What can I do if the posted citation does not contain all the violations that I believed existed in the workplace?

A. You may request an informal conference with the Assistant Regional Director to discuss any issue raised by the inspection. If you are granted an informal conference the Assistant Regional Director *may* permit your employer to sit in. (Also, if your employer receives an informal conference, the Assistant Regional Director may allow you to participate.) If a settlement is reached at the informal conference, it must be consistent with the purpose of providing safe and healthful working conditions. The Assistant Regional Director's decision regarding everything except the appropriateness of the abatement period is final as far as you are concerned. However, your employer may contest the citation, penalty or abatement period.

Q. What can I do if I'm not satisfied with the result of the informal conference?

A. Your last resort is to file a notice of contest regarding the reasonableness of the time set for abatement of the violation. You cannot question whether the employer is abating the violation, the method of abatement, the citation, the penalty or any other issue.

Q. How do I contest the reasonableness of the abatement period?

A. You must file a written notice of contest which states: (1) you are an affected employee or an authorized employee representative and (2) that the period fixed for abatement in a citation is unreasonable. This written notice of contest must be postmarked within 15 days from the day your employer received the citation. The notice of contest must be sent to your local OSHA Area Director. (See Tables VI and VII.) You must also file a notice of contest with your employer who must post it. Your case will then be heard by an administrative law judge who will make a decision. You will be notified of the hearing at least 10 days in advance. You can then appeal the administrative law judge's decision to the Occupational Safety and Health Review Commission and from there you can appeal the decision to the Courts.

Q. How will I know if my employer contests the citation, penalty or abatement period?

A. Your employer must post the notice of contest in the way the initial citation was posted.

Q. What can I do if my employer contests the citation, penalty or the abatement period?

A. You can elect to participate as a "party." You do this by filing with the Occupational Safety and Health Review Commission a "Statement of Intent to Participate" or a "Statement of Position" that states your position on the issue of contest.

Q. What does becoming a "party" entitle me to?

A. You will be sent all correspondence between your employer and the Occupational Safety and Health Review Commission. You must also send all your correspondence to the Occupational Safety and Health Review Commission to all other "parties." You may file a statement of position with respect to the issue. You may also file a response to a statement which was filed by another party. You have the right to bring in witnesses and cross-examine witnesses. You have the right to a copy of exhibits entered into evidence. You also have the right to receive a copy of the judge's decision. You also have the right to appear as a "party" in any appeal.

How Does OSHA Protect Me from Discrimination?

Section 11(c)(1) of the OSH Act states "No person shall discharge or in any manner discriminate against any employee because such employee has filed any complaint or instituted or caused to be instituted any proceeding under or related to this Act or has testified or is about to testify in any such proceeding or because of the exercise by such employee on behalf of himself or others as any right afforded by this Act."

Some of the protected activities are:

1. Filing an OSHA complaint in good faith requesting an inspection.
2. Pointing out hazardous conditions to an OSHA Compliance Officer.
3. Requesting an informal conference with the OSHA Regional Administrator.
4. Filing a formal complaint protesting the period set for abatement in a citation.
5. Participating as a "party" in any hearing held by the Occupational Safety and Health Review Commission.
6. Walking around with the OSHA Compliance Officer if you are the designated employee representative.
7. Commenting on proposed OSHA rules, regulations and standards.
8. Filing a discrimination complaint in good faith against your employer.
9. Refusing to work, in good faith, if you are exposed to an imminent danger if:
   a. Where possible, you have asked your employer to eliminate the danger and he fails to do so;
   b. The danger is so imminent that there is not sufficient time to have the danger eliminated through the normal enforcement procedures;
   c. The danger facing you is so grave that a "reasonable person" in the same situation would conclude there is real danger of death or serious physical injuries, and
   d. You have no reasonable alternative.
10. Testifying at a variance hearing and appealing the final decision if you disagree with it.
11. Requesting information from your employer on safety and health hazards in your work areas, on precautions to be taken, and on procedures to be followed if involved in an accident or if exposed to toxic substances.
12. Requesting a NIOSH Health Hazard Evaluation.
13. Requesting your employer to eliminate a hazardous condition.

These are only some of the protective activities under the OSH Act. If you engage in one or more of these activities and your employer discharges you, disciplines you, demotes you, refuses to promote you or denies you benefits, you may file a discrimination complaint with OSHA or the NLRB or file a grievance under your grievance procedure.

Certain activities, however, are not protected under the OSH Act.

Activities not protected by the OSH Act are:

1. Refusing to wear personal protective equipment where it is required.
2. Refusing to follow your employer's reasonable rules and regulations.
3. Filing complaints for the sole purpose of harassment.
4. Refusing to work under non-imminent danger conditions.

Your employer may discharge or discipline you for engaging in these activities and others. Under the OSH Act employees must comply with all safety and health rules and regulations that apply to your own actions and conduct.

Table VIII

Where Do I Contact the Correct OSHA Representative?

U.S. Department of Labor Regional Offices for Occupational Safety and Health Administration

REGION I
(CT, ME, MA, NH, RI, VT)
JFK Federal Building
Room 1804
Government Center
Boston, MA 02203
Telephone: (617) 223-6712

REGION II
(NY, NJ, PR, VI, CZ)
Room 3445
1 Astor Plaza
1515 Broadway
New York, NY 10036
Telephone: (212) 399-5754

REGION III
(DE, DC, MD, PA, VA, WV)
Gateway Building
Suite 2100
3535 Market Street
Philadelphia, PA 19104
Telephone, (215) 596-1201

REGION IV
(AL, FL, GA, KY, MS, NC, SC, TN)
1375 Peachtree Street, N.E.
Suite 587
Atlanta, GA 30309
Telephone: (404) 881-3573

REGION V
(IL, IN, MN, MI, OH, WI)
230 South Dearborn Street
32nd Floor
Room 3263
Chicago, IL 60604
Telephone: (312) 353-2220

REGION VI
(AR, LA, NM, OK, TX)
555 Griffin Square
Room 602
Dallas, TX 75202
Telephone: (214) 749-2477

REGION VII
(IA, KS, MO, NE)
911 Walnut Street
Room 3000
Kansas City, MO 64106
Telephone: (816) 374-5861

REGION VIII
(CO, MT, ND, SD, UT, WY)
Federal Building
Room 15010
1961 Stout Street
Denver, CO 80294
Telephone: (303) 837-3883

REGION IX
(CA, AZ, NV, HI)
Box 36017
450 Golden Gate Avenue
San Francisco, CA 94102
Telephone: (415) 556-0586

REGION X
(AK, ID, OR, WA)
Federal Office Building
Room 6048
909 First Avenue
Seattle, WA 98174
Telephone: (206) 442-5930

U.S. Department of Labor Area Offices for Occupational Safety and Health Administration

ALABAMA
Birmingham, AL 35216
2047 Canyon Road
Todd Mall
Telephone: (205) 822-7100
Mobile, AL 36602
Commerce Building
Room 600
118 North Royal Street
Telephone: (205) 690-2131

ALASKA
Anchorage, AK 99501
Federal Building
Room 227
605 West 4th Avenue
Telephone: (970) 265-5341

ARIZONA
Phoenix, AZ 85004
Amerco Towers
Suite 318
2721 North Central Avenue
Telephone: (602) 261-4858

ARKANSAS
Little Rock, AR 72205
West Mark Building
Suite 212
4120 West Markham
Telephone: (501) 378-6291

CALIFORNIA
Long Beach, CA 90802
400 Oceangate
Suite 530
Telephone: (213) 432-3434
San Francisco, CA 94105
211 Main Street
Telephone: (415) 556-7260

COLORADO
Lakewood, CO 80215
Squire Plaza Building
8527 West Colfax Avenue
Telephone: (303) 234-4471

CONNECTICUT
Hartford, CT 06103
Federal Building
Room 6178
450 Main Street
Telephone: (203) 244-2294

DISTRICT OF COLUMBIA
Washington, DC 20215
400 First Street, N.W.
Room 602
Telephone: (202) 523-5224

FLORIDA
Fort Lauderdale, FL 33308
Bridge Building
Room 204
3200 E. Oakland Park Blvd.
Telephone: (305) 566-6547
Jacksonville, FL 32207
Art Museum Plaza
Suite 4
2809 Art Museum Drive
Telephone: (904) 791-2895
Tampa, FL 33602
700 Twiggs Street
Room 624
Telephone: (813) 228-2821

GEORGIA
Macon, GA 31204
Riverside Plaza Shopping Cen.
2720 Riverside Drive
Telephone: (912) 746-5143
Savannah, GA 31405
Enterprise Building
Suite 210A
6605 Abercorn Street
Telephone: (912) 354-9733
Tucker, GA 30084
Building 10
Suite 33
La Vista Perimeter Office Park
Telephone: (404) 939-8987

HAWAII
Honolulu, HI 96805
300 Ala Moana Boulevard
Suite 5122
Telephone: (808) 546-3157

IDAHO
Boise, ID 83707
1315 West Idaho Street
Telephone: (208) 384-1867

ILLINOIS
Aurora, IL 60542
344 Smoke Tree Business Park
Telephone: (312) 896-8700
Calumet City, IL 60409
1400 Torrence Avenue
2nd Floor
Telephone: (312) 891-3800
Niles, IL 60648
6000 W. Touhy Avenue
Telephone: (312) 631-8200
Peoria, IL 61603
228 N.E. Jefferson
3rd Floor
Telephone: (309) 671-7033

INDIANA
Indianapolis, IN 36204
U.S. Post Office & Courthouse
46 East Ohio Street
Room 423
Telephone: (317) 269-7290

IOWA
Des Moines, IA 50309
210 Walnut Street
Room 638
Telephone: (515) 284-4794

KANSAS
Wichita, KS 67202
216 N. Waco
Suite B
Telephone: (316) 267-6311
Extension 644

KENTUCKY
Louisville, KY 40303
600 Federal Place
Suite 554-E
Telephone: (502) 582-6111

LOUISIANA
Baton Rouge, LA 70806
2156 Wooddale Boulevard
Hoover Annex
Suite 200
Telephone: (504) 387-0181
Extension 474

Louisiana (Continued)
New Orleans, LA 70130
546 Carondelet Street
Room 202
Telephone: (504) 589-2451

MARYLAND
Baltimore, MD 21201
Federal Building
Room 1110
Charles Center
31 Hopkins Plaza
Telephone: (301) 962-2840

MASSACHUSETTS
Springfield, MA 01103
1200 Main Street
Suite 513
Telephone: (410) 981-2420
Extension 522
Waltham, MA 02154
400-2 Totten Pond Road
Telephone: (617) 894-2400

MICHIGAN
Detroit, MI 48226
231 West Lafayette
Room 628
Telephone: (313) 226-6720

MINNESOTA
Minneapolis, MN 55401
110 South Fourth Street
Room 437
Telephone: (612) 725-2571

MISSISSIPPI
Jackson, MS 39211
5760 I-55 North
Frontage Road East
Telephone: (601) 969-4606

MISSOURI
Kansas City, MO 64106
1150 Grand Avenue
6th Floor
12 Grand Building
Telephone: (816) 374-2756
St. Louis, MO 63101
210 North 12th Boulevard
Room 520
Telephone: (314) 425-5461

MONTANA
Billings, MT 59101
Petroleum Building
Suite 525
2812 1st Avenue North
Telephone: (406) 245-6711
Extension 6640/9

NEBRASKA
North Platte, NE 69101
113 West 6th Street
Telephone: (308) 534-9450
Omaha, NE 68106
Overland-Wolf Building
Room 100
6910 Pacific Street
Telephone: (402) 221-9341

NEVADA
Carson City, NV 89701
1100 E. William Street
Suite 222
Telephone: (702) 883-1226

NEW HAMPSHIRE
Concord, NH 03301
Federal Building
Room 426
55 Pleasant Street
Telephone: (603) 224-1995

NEW JERSEY
Belle Mead, NJ 08502
Belle Mead GSA Depot
Building T3
Telephone: (201) 359-2777
Camden, NJ 08104
2101 Ferry Avenue
Room 403
Telephone: (609) 757-5181
Dover, NJ 07801
2E Blackwell Street
Telephone: (201) 361-4050
Hasbrouck Heights, NJ 07604
Teterboro Airport Professional Building
377 Route 17
Room 206
Telephone: (201) 288-1700
Newark, NJ 07102
970 Broad Street
Room 1435C
Telephone: (201) 645-5930

NEW MEXICO
Albuquerque, NM 87103
Federal Building
Room 3114
500 Gold Avenue, S.W.
Telephone: (505) 766-3411

NEW YORK
Albany, NY 12207
Leo W. O'Brien Federal Building
Clinton Ave. and N. Pearl St.
Room 132
Telephone: (518) 472-6085
Brooklyn, NY 11201
185 Montague Street
Telephone: (212) 330-7667
Buffalo, NY 14202
111 W. Huron Street
Room 1002
Telephone: (716) 842-3333
Flushing, NY 11354
136-21 Roosevelt Avenue
Telephone: (212) 445-5005
Garden City, L.I., NY 11530
370 Old Country Road
Telephone: (516) 294-0400
New York, NY 10007
90 Church Street
Room 1405
Telephone: (212) 264-9840
Rochester, NY 14614
Federal Office Building
Room 600
100 State Street
Telephone: (716) 263-6755
Syracuse, NY 13202
100 So. Clinton Street
Room 1267
Telephone: (315) 423-5188
White Plains, NY 10601
200 Mamaroneck Avenue
Room 302
Telephone: (914) 761-4250
Extension 721

NORTH CAROLINA
Raleigh, NC 27601
Federal Office Building
Room 406
310 New Bern Avenue
Telephone: (919) 755-4770

NORTH DAKOTA
Bismarck, ND 58501
Russel Building
Highway 83 North, Route 1
Telephone: (701) 255-4011
Extension 521

OHIO
Cincinnati, OH 45202
Federal Office Building
Room 4028
550 Main Street
Telephone: (513) 684-2354
Cleveland, OH 44199
Federal Office Building
Room 847
1240 East Ninth Street
Telephone: (216) 522-3818
Columbus, OH 43215
Federal Office Building
Room 634
200 N. High Street
Telephone: (614) 469-5582
Toledo, OH 43604
Federal Office Building
Room 734
234 North Summit Street
Telephone: (419) 259-7542

OKLAHOMA
Oklahoma City, OK 73118
50 Penn Place
Suite 408
Telephone: (405) 231-5351
Tulsa, OK 74127
717 S. Houston
Suite 304
Telephone: (918) 581-7676

OREGON
Portland, OR 97204
1220 S.W. Third Street
Room 640
Telephone: (503) 221-2251

PENNSYLVANIA
Harrisburg, PA 17109
Progress Plaza
49 N. Progress Avenue
Telephone: (717) 657-0100
Monroeville, PA 15146
Jonnet Building
Room 802
4099 William Penn Highway
Telephone: (412) 644-2905
Philadelphia, PA 19106
Wm. J. Green, Jr. Federal Building
600 Arch Street
Room 4256
Telephone: (215) 597-4955
Wilkes-Barre, PA 18701
Penn Place
Room 3107
20 North Pennsylvania Avenue
Telephone: (717) 826-6538

PUERTO RICO
Hato Rey, PR 00918
U.S. Courthouse and FOB
Carlos Chardon
Room 555
Telephone: (809) 753-4457

SOUTH CAROLINA
Columbia, SC 29204
Kittrell Center
Suite 102
2711 Middleburg Drive
Telephone: (803) 765-5904

SOUTH DAKOTA
Sioux Falls, SD 57102
Court House Plaza Building
Room 408
300 North Dakota Avenue
Telephone: (605) 336-2980
Extension 425

TENNESSEE
Nashville, TN 37203
1600 Hayes Street
Suite 302
Telephone: (615) 749-5313

TEXAS
Austin, TX 78701
American Bank Tower
Suite 310
221 W. 6th Street
Telephone: (512) 397-5783

Harlingen, TX 78550
Riverview Professional Building
S. 77 Sunshine Strip
Suite 9
Telephone, (512) 425-6811

Houston, TX 77004
2320 La Branch Street
Room 2118
Telephone: (713) 226-5431

Texas (Continued)
Irving, TX 75061
1425 W. Pioneer Drive
Telephone: (214) 749-7555

Lubbock, TX 79401
Federal Building
Room 421
1205 Texas Avenue
Telephone: (806) 762-7681

Tyler, TX 75701
FOB-USPO and Courthouse
Room 208
211 W. Ferguson Street
Telephone: (214) 595-1404

UTAH
Salt Lake City, UT 84101
U.S. Post Office Building
Room 451
350 South Main Street
Telephone: (801) 524-5080

VIRGINIA
Richmond, VA 23240
Federal Building
Room 8018
400 North 8th Street
Telephone: (804) 782-2864

WASHINGTON
Bellevue, WA 98004
121 107th Avenue, N.E.
Telephone: (206) 442-7520

WEST VIRGINIA
Charleston, WV 25301
Charleston National Plaza
Room 1726
700 Virginia Street
Telephone: (304) 343-6181
Extension 420

WISCONSIN
Appleton, WI 54911
2618 North Ballard Road
Telephone: (414) 734-4521

Milwaukee, WI 53203
Clark Building
Room 400
633 West Wisconsin Avenue
Telephone: (414) 224-3315

Table IX

Which States Have Approved Occupational Safety and Health Plans Under Section 18 of the Occupational Safety and Health Act of 1970?

Alaska

Commissioner
Department of Labor
Post Office Box 1149
Juneau, Alaska 99801
Telephone: (907) 465-3500

Arizona

Director
Industrial Commission of Arizona
1601 W. Jefferson
Post Office Box 19070
Phoenix, Arizona 85005
Telephone: (602) 271-4411

California

Secretary
Agriculture and Services Agency
1220 N Street, Room 114
Sacramento, California 95814

Colorado

Executive Director
Department of Labor and Employment
200 East Ninth Avenue
Denver, Colorado 80203
Telephone: (303) 573-6440

Hawaii

Director
Department of Labor and Industrial Relations (DLIR)
825 Mililani Street
Honolulu, Hawaii 96813
Telephone: (808) 548-3150

Indiana

Commissioner
Indiana Division of Labor
Indiana State Office Building, Room 1012
100 North Senate Avenue
Indianapolis, Indiana 46204
Telephone: (317) 633-4473

Iowa

Commissioner
Bureau of Labor
East 7th and Court Avenue
Des Moines, Iowa 50319
Telephone: (515) 281-3606

Kentucky

Commissioner
Kentucky Department of Labor
Capitol Plaza
Frankfort, Kentucky 40601
Telephone: (502) 564-3070

Maryland

Commissioner
Department of Licensing and Regulation
Division of Labor and Industry
203 E. Baltimore Street
Baltimore, Maryland 21202
Telephone: (301) 383-2250

Michigan

Director
Michigan Department of Labor
State Secondary Complex
7150 Harris Drive
Lansing, Michigan 48933
Telephone: (517) 373-3575

Minnesota

Commissioner
Department of Labor and Industry
Space Center Building
444 Lafayette Road
St. Paul, Minnesota 55101
Telephone: (612) 296-2342

Nevada

Director of Health and Safety
Department of Occupational Safety and Health
Nevada Industrial Commission
515 East Musser Street
Carson City, Nevada 89701
Telephone: (702) 882-7268

New Mexico

Director
Health and Social Services
Post Office Box 2348
Santa Fe, New Mexico 87501

North Carolina

OSHA Director
Department of Labor
Post Office Box 27407
Raleigh, North Carolina 27601
Telephone: (919) 829-7166

Oregon

Chairman of the Board
Worker's Compensation Board
Labor and Industries Building
Salem, Oregon 97310
Telephone: (503) 378-3302

As of January 1978

Puerto Rico

Acting Under-Secretary of Labor
Commonwealth of Puerto Rico
414 Barbosa Avenue
San Juan, Puerto Rico 00917

South Carolina

Commissioner
Department of Labor
Post Office Box 11329
Columbia, South Carolina 29211
Telephone: (803) 758-2851

Tennessee

Commissioner
Tennessee Department of Labor
C1-100 Cordell Hull Building
Nashville, Tennessee 37219
Telephone: (615) 741-2582

Utah

Chairman
Utah Industrial Commission
448 South 4th East
Salt Lake City, Utah 84114
Telephone: (801) 328-6401

Vermont

Commissioner
Department of Labor and Industry
State Office Building
Montpelier, Vermont 05602
Telephone: (802) 828-2286

Virgin Islands

Commissioner of Labor
Post Office Box 708, Christainsted
St. Croix, Virgin Islands 00820

Virginia

Commissioner
State Department of Health
James Madison Building
109 Governor Street
Richmond, Virginia 23219
Telephone: (703) 770-3563

Washington

Director
Department of Labor and Industries
General Administration Building
Olympia, Washington 98501
Telephone: (206) 753-6341

Wyoming

State Health and Safety Administrator
Occupational Health and Safety Department
200 E. 8th Avenue
Post Office Box 2186
Cheyenne, Wyoming 82001
Telephone: (307) 777-7786

Table X

U.S. DEPARTMENT OF LABOR
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

Form Approved
OMB No. 044R1449

For Official Use Only			
Area	Date Received	Time	
Region	Received By	Formal	
		Non Formal	

COMPLAINT

This form is provided for the assistance of any complainant and is not intended to constitute the exclusive means by which a complaint may be registered with the U.S. Department of Labor.

Sec. 8(f)(1) of the Williams-Steiger Occupational Safety and Health Act, 29 U.S.C. 651, provides as follows: Any employees or representative of employees who believe that a violation of a safety or health standard exists that threatens physical harm, or that an imminent danger exists, may request an inspection by giving notice to the Secretary or his authorized representative of such violation or danger. Any such notice shall be reduced to writing, shall set forth with reasonable particularity the grounds for the notice, and shall be signed by the employees or representative of employees, and a copy shall be provided the employer or his agent no later than at the time of inspection, except that, upon request of the person giving such notice, his name and the names of individual employees referred to therein shall not appear in such copy or on any record published, released, or made available pursuant to subsection (g) of this section. If upon receipt of such notification the Secretary determines there are reasonable grounds to believe that such violation or danger exists, he shall make a special inspection in accordance with the provisions of this section as soon as practicable, to determine if such violation or danger exists. If the Secretary determines there are no reasonable grounds to believe that a violation or danger exists he shall notify the employees or representative of the employees in writing of such determination.

NOTE: Section 11(c) of the Act provides explicit protection for employees exercising their rights, including making safety and health complaints.

The undersigned *(check one)*

☐ Employee ☐ Representative of employees ☐ Other *(specify)* _____

believes that a violation at the following place of employment of an occupational safety or health standard exists which is a job safety or health hazard.

Employer's Name _____

Address (Street _____ Telephone _____
(City _____ State _____ Zip Code _____

1. Kind of business _____
2. Specify the particular building or worksite where the alleged violation is located, including address. _____
3. Specify the name and phone number of employer's agent(s) in charge.
4. Describe briefly the hazard which exists there including the approximate number of employees exposed to or threatened by such hazard.

(Continue on reverse side if necessary)

(Continued on reverse side)

Form OSHA-7
Rev. Aug. 1976

5. List by number and/or name the particular standard *(or standards)* issued by the Department of Labor which you claim has been violated, if known.

6. (a) To your knowledge has this violation been considered previously by any Government agency? _____

(b) If so, please state the name of the agency _____

(c) and, the appropriate date it was so considered. _____

7. (a) Is this complaint, or a complaint alleging a similar violation, being filed with any other Government agency?

(b) If so, give the name and address of each. _____

8. (a) To your knowledge, has this violation been the subject of any union/management grievance or have you *(or anyone you know)* otherwise called it to the attention of, or discussed it with, the employer or any representative thereof? _____

(b) If so, please give the results thereof, including any efforts by management to correct the violation. _____

9. Please indicate your desire:

☐ I do not want my name revealed to the employer.

☐ My name may be revealed to the employer.

COMPLAINANT'S NAME

NOTE: IT IS UNLAWFUL TO MAKE ANY FALSE STATEMENT, REPRESENTATION OR CERTIFICATION IN ANY DOCUMENT FILED PURSUANT TO THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970. VIOLATIONS CAN BE PUNISHED BY A FINE OF NOT MORE THAN $10,000, OR BY IMPRISONMENT OF NOT MORE THAN SIX MONTHS, OR BY BOTH. (Section 17(g))

Signature _____ Date _____

Typed or Printed Name _____

Address (Street _____ Telephone _____

(City _____ State _____ Zip Code _____

If you are an authorized representative of employees affected by this complaint, please state the name of your organization and your title. _____

Table XI

U.S. DEPARTMENT OF LABOR
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

CITATION and NOTIFICATION OF PENALTY

[redacted]

INSPECTION DATE:

INSPECTION SITE:

TO:

PENALTIES ARE DUE WITHIN 15 DAYS OF RECEIPT OF THIS NOTIFICATION UNLESS CONTESTED (See additional Booklet)

This Section May Be Detached Before Posting

OSHA AREA OFFICE MUST DETACH THIS SECTION BEFORE MAILING OR FILING IN CASE FILE

THE LAW REQUIRES that a copy of this Citation be posted immediately in a conspicuous place at or near the location of the violation(s) cited below. The Citation must remain posted until the violations cited below have been corrected, or for 3 working days (excluding weekends and Federal holidays), whichever is longer.

This citation describes violations of the Occupational Safety and Health Act of 1970. The penalty(ies) listed below are based on these violations. You must correct the violations referred to in this citation by the dates listed below and pay the penalties proposed, unless within 15 working days (excluding weekends and Federal holidays) from your receipt of this citation and penalty you mail a notice of contest to the U.S. Department of Labor Area Office at the address shown above. (See the enclosed booklet which outlines your responsibilities and rights and should be read in conjunction with this form.)

ITEM NUMBER(S) STANDARD, REGULATION OR SECTION OF THE ACT VIOLATED	DESCRIPTION	DATE BY WHICH VIOLATION MUST BE CORRECTED	PENALTY	NOTE	S	W

* AREA DIRECTOR

NOTICE TO EMPLOYEES – The law gives an employee or his representative the opportunity to object to any abatement date set for a violation if he believes the date to be unreasonable. The contest must be mailed to the U.S. Department of Labor Area Office at the address shown above within 15 working days (excluding weekends and Federal holidays) of the receipt by the employer of this citation and penalty.

EMPLOYER RESPONSIBILITIES AND COURSES OF ACTION – The enclosed booklet outlines employer responsibilities and courses of action and should be read in conjunction with this notification.

EMPLOYER DISCRIMINATION UNLAWFUL – The law prohibits discrimination by an employer against an employee for filing a complaint or for exercising any rights under this Act. An employee who believes that he has been discriminated against may file a complaint no later than 30 days after the discrimination with the U.S. Department of Labor Area Office at the address shown above.

TOTAL PENALTY FOR THIS CITATION (Make check or Money Order Payable To: DOL, OSHA. Indicate OSHA No. on Remittance)

TOTAL PENALTY FOR THIS PAGE

CITATION AND NOTIFICATION OF PENALTY

OSHA 2 (REV. 5/72)

DETACH HERE

Table XII

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

CSHO NO.	OSHA-1 NO.
AREA	REGION
NO.	DATE

DE MINIMIS NOTICE

TO: _____

During a safety and health inspection of your workplace on _____ 19___, located at _____, a Compliance Safety and Health Officer, U.S. Department of Labor, noted the following alleged de minimis violations of standards or regulations issued under the Occupational Safety and Health Act of 1970, 29 U.S.C. 651. Although these alleged violations do not have a direct or immediate relationship to safety or health, they should be corrected in order to improve your safety and health program. There is no requirement in the Act that this notice be posted.

Item No.	Condition

Area Director's Signature _____

GPO 915-190

Form OSHA-7B
Aug. 1971

Table XIII

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

CSHO NO.	OSHA-1 NO.	FY
AREA	REGION	

TO:
1

NOTIFICATION
OF FAILURE TO CORRECT ALLEGED VIOLATION
AND OF PROPOSED ADDITIONAL PENALTY

On the 3 _____ day of _____, 19___, a Citation(s) was (were) issued to you in accordance with the provisions of section 9(a) of the Occupational Safety and Health Act of 1970 (84 Stat. 1601; 29 U.S.C. 651, *et seq.*), hereinafter referred to as the Act, notifying you of certain alleged violations of the Act and the dates by which they were to be corrected.

Based upon reinspection conducted on 4 _____, it is alleged that you have failed to correct the alleged violations specified below within the times prescribed.

5. SERIOUS VIOLATIONS:

5A Citation No.	5B Number of Days Failed to Correct		5C Proposed Daily Additional Penalty		5D Proposed Total Additional Penalty For Failure To Correct
		X		=	

6. NONSERIOUS VIOLATIONS

6A Citation No. and Item No.	6B Number of Days Failed to Correct		6C Proposed Daily Additional Penalty	=	6D Proposed Total Daily Additional Penalty	+	6E Previously Allowed Abatement Credit	=	6F Proposed Total Additional Penalty For Failure to Correct
		X		=		+		=	

7. Area Director _____ 8. Date _____ 19___

(NOTICE: Additional Important Information On Reverse Side)

Form OSHA-2B
Rev. Sept. 1972

Table XIV

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

CSHO NO.	OSHA-1 NO.	FY
AREA	REGION	

NOTICE

of

ALLEGED IMMINENT DANGER

(TO EMPLOYER(S) AND EMPLOYEES)

An inspection has been conducted of a place of employment in which employees of employer(s) are working, located at _____ and described as follows: _____

On the basis of this inspection, it is alleged that an imminent danger to employees exists in that A DANGER EXISTS WHICH COULD REASONABLY BE EXPECTED TO CAUSE DEATH OR SERIOUS PHYSICAL HARM IMMEDIATELY or before the imminence of such danger can be eliminated through the enforcement procedures otherwise provided by the Occupational Safety and Health Act of 1970 (29 U.S.C. 651 *et seq.*), hereinafter referred to as the Act.

In accordance with the provisions of Section 13(a) of the Act, the employer(s) and all employees affected by these conditions constituting an alleged imminent danger are being informed of the possible danger by the posting of this Notice of Alleged Imminent Danger near the condition(s) described below. The employer(s) and all affected employees are likewise being informed that it will be recommended to the Secretary of Labor that he seek the judicial relief provided by the Act.

The Act provides that the United States District Court is empowered upon petition of the Secretary of Labor, to order the employer(s) to take such action as is necessary to avoid, correct, or remove this alleged imminent danger, including, where necessary, the removal of employees from the dangerous area.

This notice does not constitute a Citation of alleged violations or a Notification of Proposed Penalty. Appropriate Citations or Notification of Proposed Penalty will be issued to the employer(s).

DESCRIPTION OF ALLEGED IMMINENT DANGER

This Notice of Alleged Imminent Danger must remain posted until removed by a representative of the Occupational Safety and Health Administration.

Signed and dated at _____, this _____ day of _____ 19___

_____
Compliance Safety and Health Officer
Occupational Safety and Health Administration
U. S. Department of Labor

Form OSHA-9
Rev. Nov. 1972

Table XV

Who Should I Contact for a NIOSH Health Hazard Evaluation of My Work Site?

Region	*Consultant*
I	NIOSH JFK Federal Building, Room 1401 Boston, Massachusetts 02203 Telephone: (617) 223-6668
II	NIOSH 26 Federal Plaza, Room 3300 New York, NY 10007 Telephone: (212) 264-2485
III	NIOSH Post Office Box 13716 Philadelphia, PA 19101 Telephone: (215) 596-6716
IV	NIOSH Room 836 57th Street, N.E. Atlanta, GA 30323 Telephone: (404) 881-4474
V	NIOSH 300 South Wacker Drive 33rd Floor Chicago, IL 60606 Telephone: (312) 886-3881
VI	NIOSH 1200 Main Tower Building Dallas, TX 75202 Telephone: (214) 655-3081
VII	NIOSH 601 E. 12th Street 5th Floor West Kansas City, Missouri 64106 Telephone: (816) 374-5332
VIII	NIOSH 11037 Federal Building Denver, Colorado 80294 Telephone: (303) 837-3979
IX	NIOSH 50 United Nations Plaza, Room 231 San Francisco, CA 94102 Telephone: (415) 556-3781
X	NIOSH 1321 Second Avenue Mail Stop 502 Seattle, Washington 98101 Telephone: (206) 442-0530

38 Compounds of the Paint Industry and 49 Ways They Can Ruin Your Health

This summary of the MSSM findings makes no distinction between the harms of long- and short-term exposure nor high and low concentrations of exposure. However, painters and allied tradesmen are exposed to these chemicals for longer periods of time and in higher concentrations during the course of their work than would be an "average" citizen. Consequently, the chart does indicate harms painters and allied tradesmen are more likely to suffer as a direct result of their occupation.

| | NEUROLOGICAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESPIRATORY | | | | | | | | | | | | | | | | | | |